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[*Discovery Reports. Vol. XII, pp.* 1–58, *December*, 1935.]

COAST FISHES

PART I. THE SOUTH ATLANTIC

By

J. R. NORMAN
Department of Zoology, British Museum
(Natural History)

CONTENTS

COAST FISHES

PART I. THE SOUTH ATLANTIC[1]

(INCLUDING THE CAPE VERDE ISLANDS, WEST AFRICA, SOUTH AFRICA, ASCENSION ISLAND, TRISTAN DA CUNHA AND GOUGH ISLAND)

By J. R. Norman
Department of Zoology, British Museum (Natural History)

(Text-figs. 1–15.)

INTRODUCTION

The collection of coast fishes[2] obtained by the R.R.S. 'Discovery' and the R.R.S. 'William Scoresby' is so large that it has proved necessary to divide the report on these fishes into three sections, of which the present one is the first. The second part

[1] A certain number of fishes were also obtained by the expedition in New Zealand. Of these, some were collected by the R.R.S. 'Discovery II'; others were presented by the N.Z. Fisheries, Ltd., Wellington, and were selected from specimens in the fish market; and a small series of freshwater fishes was obtained through the courtesy of the New Zealand Marine Department. These New Zealand fishes will form a very valuable addition to the collections of the British Museum, but it has not seemed necessary to deal with them in detail here. A list of the species represented is given below, and references to nearly all these are to be found in the check-list of New Zealand fishes published by Phillipps in 1927 (*N.Z. Marine Dept., Fisheries Bull.*, No. 1).

Geotria australis, Gray
Eptatretus cirrhatus (Schn.)
Mustelus manazo, Bleek. ?
Raja nasuta, Müll. and Henle
Trygon brevicaudata, Hutton
Argentina elongata, Hutton
Retropinna retropinna (Richardson)
Galaxias fasciatus, Gray
Galaxias attenuatus (Jenyns)
Prototroctes oxyrhynchus, Günth.
Gonorhynchus gonorhynchus (Linn.)
Chlorophthalmus nigripinnis, Günth.
Conger conger (Linn.)
Ariosoma habenata (Richardson)
Macruronus novae-zelandiae (Hector)
Physiculus bachus (Schn.)
Hoplopteryx affinis (Günth.)
Zeus faber, Linn.
Polyprion oxygeneios (Schn.)
Caesioperca lepidoptera (Schn.)
Usacaranx lutescens (Richardson)
Trachurus novae-zelandiae, Richardson
Dactylopagrus macropterus (Schn.)
Parapercis colias (Schn.)
Hemerocoetes pauciradiatus, Regan
Thyrsites atun (Euphrasen)
Gobiomorphus gobioides (Cuv. and Val.)
Favonigobius lateralis (Macleay)
Tripterygion varium (Schn.)
Helcogramma medium (Günth.)
Genypterus blacodes (Schn.)
Agonostomus forsteri (Schn.)
Seriolella brama (Günth.)
Pterygotrigla picta (Günth.)
Chelidonichthys kumu (Lesson and Garnot)
Lepidotrigla brachyoptera, Hutton
Lophonectes gallus, Günth.
Pelotretis flavilatus, Waite
Peltorhamphus novae-zeelandiae, Günth.
Rhombosolea retiaria, Hutton
Rhombosolea leporina, Günth.
Meuschenia convexirostris (Günth.)

[2] The term "coast fishes" was suggested by Regan (1914, *Rep. Brit. Antarct.* ('*Terra Nova*') *Exped.*, 1910, Zool., I, p. 24) to include not only the littoral forms but also fishes that may occur at no great distance from the coasts in water down to two or three hundred fathoms deep, and are not pelagic or bathypelagic. The true oceanic fishes have been dealt with in a previous report (Norman, 1930, *Discovery Reports*, II, pp. 261–370, pl. ii, 47 text-figs.).

will include the important collections made during the trawling survey of the Magellan-Falkland Islands region, and will also deal with the fishes of the coast of Chile. The fishes of South Georgia, the South Orkneys, the South Shetlands, and those of the Antarctic Continent, will form the subject of the last section of the report.

On her first commission the 'Discovery' made brief calls at Ascension and Tristan da Cunha on her way to the south, and a few fishes were obtained at both these islands. In July 1927 she called at the Cape, and while the ship was in dock at Simon's Town Mr E. R. Gunther and Mr F. C. Fraser were able to make a trip lasting about five days in one of the South African commercial trawlers (S.T. 'Richard Bennet') and to preserve a valuable collection of deep-water fishes obtained with the trawl. On the homeward voyage in 1927 the 'Discovery' made several hauls off the coasts of Angola and French Congo, and off Annobon, obtaining a very interesting series of fishes, several of which have proved to be new to science. After leaving the Gulf of Guinea a call was made at the Cape Verde Islands, where a few fish were collected. In June 1927 the 'William Scoresby' was at Gough Island, and one or two fishes were obtained from here.

All the text-figures accompanying this report are the work of Lieut.-Col. W. P. C. Tenison, D.S.O., who has prepared the drawings with his customary care and skill.

The author takes this opportunity of expressing his sincere thanks to the members of the Discovery Committee for permission to study these collections and to undertake the preparation of this report.

CAPE VERDE ISLANDS

Examples of only five species were collected here, but three of these are of particular interest.

BELONIDAE

Belone ardeola (Cuv. and Val.).

Belone ardeola, Cuvier and Valenciennes, 1846, *Hist. Nat. Poiss.*, XVIII, p. 425.

Belone trachura, Cuvier and Valenciennes, 1846, *t.c.*, p. 456; Troschel, 1866, *Arch. Naturgesch.*, XXXII (1), p. 234; Günther, 1866, *Cat. Fish.*, VI, p. 235; Fowler, 1919, *Proc. U.S. Nat. Mus.*, LVI, pp. 196, 217, fig. 1.

? *Belone depressa*, Poey, 1856–8, *Mem. H.N. Cuba*, II, p. 296.

Belone depressa, Günther, 1866, *t.c.*, p. 235.

Belone lovii, Günther, 1866, *t.c.*, p. 236.

Tylosurus ardeola, Jordan and Evermann, 1896, *Bull. U.S. Nat. Mus.*, XLVII (1), p. 713; Evermann and Marsh, 1902, *Bull. U.S. Fish. Comm.*, XX (1900), p. 99.

Belone (*Tylosurus*) *ardeola*, Metzelaar, 1919, *Trop. Atlant. Vissch.*, pp. 29, 218.

Strongylura ardeola, Nichols and Breder, 1928, *Zoologica, N.Y.*, VIII, p. 423; Breder, 1932, *Carnegie Inst. Washington*, Publ. 435, p. 7, figs.

? *Strongylura longleyi*, Breder, 1932, *t.c.*, p. 12, pl. ix, text-figs.

St Vincent. 2. ix. 27. Hand line: 2 specimens, 360, 370 mm.

Length of head (to tip of upper jaw) $2\frac{3}{4}$ to nearly $3\frac{1}{4}$ in that of fish (without caudal). Diameter of eye rather more than interorbital width and $1\frac{1}{2}$ to 2 in postorbital part of

head. 7 to 9 gill-rakers on lower part of anterior arch. 110 to 130 scales from occiput to origin of dorsal fin. Dorsal 13–17. Anal 18–21. Origin of pectoral usually nearer to last ray of anal than to head, sometimes equidistant from them. Caudal peduncle strongly depressed.

Hab. West Indies; Azores; Cape Verde Islands; Tropical West Africa; St Helena; Ascension.

The presence of gill-rakers and the comparatively slender jaws place this species in the genus *Belone*, Cuv.[1] On comparing three examples from the Cape Verde Islands, including the type of *B. lovii*, Günther, with six from the West Indies (*B. depressa*, Günther), I am unable to find any essential differences, and there is little doubt that the same species is to be found on both sides of the Atlantic. I have followed American authors in identifying this species with *B. ardeola* of Cuvier and Valenciennes, originally described from Martinique, but a re-examination of the types of this and other species of Gar-fishes described by the French authors is badly needed. The form recently described by Breder as *Strongylura longleyi* is said to differ from *Belone ardeola* only in the longer head, of which the depth is less than the width, and the somewhat larger eye. Of the West Indian specimens examined by me some appear to be referable to Breder's species, but I am of the opinion that the study of a large series of specimens would reveal this to be, at the most, a subspecies of *B. ardeola*. I have also examined twelve examples of *B. trachura* from Ascension and St Helena, and find that these differ from both West Indian and Cape Verde Islands specimens of *B. ardeola* only in the slightly higher number of dorsal and anal rays and perhaps in the larger number of predorsal scales. The eye is a little smaller than that of the Cape Verde Islands specimens, but agrees very well with some of the West Indian examples. On the whole, I think it best to recognize two subspecies: *B. ardeola ardeola* from the West Indies, Azores and Cape Verde Islands;[2] and *B. ardeola trachura* from Ascension and St Helena. The measurements of head and eye, and the fin-ray and scale counts, are shown in the accompanying table.

	West Indies (6)	Cape Verde Islands (3)	Ascension and St Helena (12)
Head in length of fish	$2\frac{3}{4}$ to 3	$2\frac{4}{5}$ to $3\frac{1}{5}$	$2\frac{4}{5}$ to $3\frac{1}{4}$
Eye in postorbital part of head	$1\frac{3}{5}$ to 2 ($2\frac{1}{10}$)	$1\frac{1}{2}$ to $1\frac{2}{3}$ (2)	($1\frac{3}{5}$) $1\frac{2}{3}$ to 2
Number of predorsal scales	112–114 (130)	110–112 (129)	(110) 120–130
Number of dorsal rays	(12) 13–14 (15)	13–14	(14) 15–17
Number of anal rays	(16) 18–19	18 (19)	19–21

[1] See Regan, 1911, *Ann. Mag. Nat. Hist.* (8) VII, p. 332.

[2] Examples presumably belonging to this subspecies have been recorded from Senegambia (Rochebrune) and St Thomé (Osorio).

CARANGIDAE

Decapterus punctatus (Cuv.).

Norman, 1935, *Ann. Mag. Nat. Hist.* (10) XVI, p. 254.

St Vincent. 2. ix. 27. Hand line: 1 specimen, 222 mm.

Hab. Atlantic coast of America, from Cape Cod to Brazil, occasionally farther north; Cape Verde Islands; Tropical West Africa.

POMACENTRIDAE

Glyphisodon hermani, Steind.

Glyphidodon (*Parma*) *hermani*, Steindachner, 1888, *SitzBer. Akad. Wiss. Wien*, XCVI (1), (1887), p. 59, pl. iii.

St Vincent. 2. ix. 27. Hand line: 1 specimen, 205 mm.

This species is new to the British Museum collection. I have nothing to add to Steindachner's excellent description and figure.

SCORPAENIDAE

Scorpaena laevis, Troschel.[1]

1866, *Arch. Naturgesch.*, XXXII (1), p. 206.

St Vincent. 2. ix. 27. Hand line: 1 specimen, 175 mm.

Depth of body 3 in the length, length of head $2\frac{1}{4}$. Depth of head at origin of dorsal fin $1\frac{1}{4}$ to $1\frac{1}{3}$ in its length. Snout about as long as eye, diameter of which is $4\frac{3}{4}$ to 5 in length of head and equal to or a little greater than interorbital width. Scales on cheek and on opercular region, but no obvious pores. A deep occipital pit. Praeorbital spines strong, the anterior with a secondary spine at its base; 3 well-developed spines on suborbital ridge. Supraorbital tentacle absent in the smaller specimen, little larger than the tentacle above the anterior edge of the eye and about $\frac{1}{3}$ diameter of eye in the larger; a number of other membranous processes on head in the larger specimen. Length of palatine band of teeth about $\frac{1}{2}$ diameter of eye. 9 gill-rakers on lower part of anterior arch. Scales cycloid; about 37 to 40 in a longitudinal series above lateral line, 4 or 5 between last soft-ray of dorsal and lateral line; breast scaled; a number of membranous processes scattered over body, especially on the back and in the region of the lateral line. Dorsal XI–XII 9; third and fourth spines longest, $2\frac{1}{3}$ to $2\frac{1}{2}$ in length of head. Anal III 5; second spine stronger and a little longer than third. Pectoral with 19 rays, extending to above vent or a little beyond, its length[2] $1\frac{1}{2}$ to $1\frac{3}{5}$ in that of head; base broad, the lowermost ray inserted level with the root of the pelvic spine and well in advance of uppermost. Greyish brown, with irregular darker markings, of which those on the fins tend to form bars; inner surface of pectoral with large dark brown or black spots, those near the base of the fin uniting to form cross-bars.

Hab. Cape Verde Islands.

In addition to the small specimen collected by the Discovery Expedition, there is a much larger one in the collection of the British Museum, 295 mm. in total length,

[1] See also p. 30 of this report.

[2] Measured from upper angle.

which has been included in the above description. This species is very close to *S. senegalensis*, Steindachner,[1] of which I have examined a single specimen from the Gold Coast, 280 mm. in total length. The Cape Verde species appears to have a shorter, deeper head, with a somewhat shorter snout, and the spines on the head are generally stouter and less acute. The supraorbital tentacle is smaller and less branched, the pectoral fin is a little shorter, and there are minor differences in the coloration. Fowler[2] has given a detailed description of a specimen, 295 mm. in length, from the Cape Verde Islands, identified by him as *S. senegalensis*, but it seems probable that his fish is referable to *S. laevis*. Both species are readily distinguished from *S. porcus*, Linn., *S. scrofa*, Linn., and *S. ustulata*, Lowe, by the smooth scales, scaly breast, and other

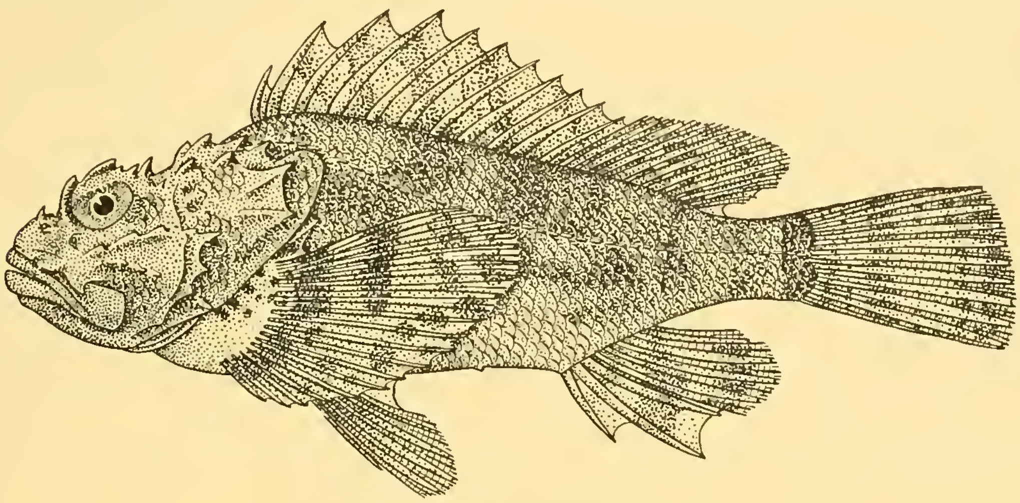

Fig. 1. *Scorpaena laevis*. $\times \frac{3}{4}$.

characters. *S. plumieri*, Bloch, from the Atlantic coast of tropical America, is closely related to *S. laevis* and *S. senegalensis*, but has the axil of the pectoral fin jet black with a few pure white spots, and there are other differences in coloration. Further, the eye is somewhat smaller and the spinous dorsal fin lower.

DACTYLOPTERIDAE

Dactylopterus volitans (Linn.).

St Vincent. 2. ix. 27. Hand line: 1 specimen, 300 mm.

WEST AFRICA

Fishes were obtained from five stations, three off the coast of Angola, one off the French Congo, and one off Annobon, Gulf of Guinea. None of the specimens are from a depth of more than 100 m. Altogether nearly 300 specimens were collected from these stations, representing about 50 species, of which 9 have proved to be new to science.

[1] 1881, *Denkschr. Akad. Wiss. Wien*, XLIV, p. 31, pl. iv.
[2] 1919, *Proc. U.S. Nat. Mus.*, LVI, p. 214.

CARCHARINIDAE

Mustelus laevis, Risso.

St. 274. 4. viii. 27. Off St Paul de Loanda, Angola. Large otter trawl, 64–65 m.: 1 male specimen, 700 mm.

SQUATINIDAE

Squatina oculata, Bonaparte.

1840, *Icon. Faune Ital.* (28), fig.; Lozano Rey, 1928, *Fauna Ibérica, Peces*, p. 494, pl. vii.

St. 272. 30. vii. 27. Off Elephant Bay, Angola. Large otter trawl, 73–91 m.: 2 male specimens, 380, 560 mm.

These specimens clearly belong to this Mediterranean species, which is also found on the southern and eastern coasts of Spain and has been beautifully figured by Lozano Rey in his monograph of the Selachians of Spain. *S. fimbriata*, Müller and Henle, of the Mediterranean, has been regarded as synonymous with *S. oculata*, but there can be little doubt that it is identical with *S. aculeata*, Cuvier. Regan[1] recorded a large specimen of *Squatina* from Lagos as *S. africana*, Regan, a Natal species, but a re-examination of this specimen shows that it belongs to *S. oculata*. The two species are very closely related, but *S. oculata* has smaller spiracles than *S. africana*, with fringed anterior margins, the lobes of the caudal fin more acutely pointed, and the dorsal fins narrower and more acute. There are also differences in the coloration. The large example recorded by Metzelaar[2] from Goree is clearly referable to *S. oculata*. The following represents a synopsis of the European and African species of *Squatina*:

I. A mid-dorsal series of enlarged denticles in the adult, forming a row of sharp spines along the back ... ... *aculeata*, Cuv. [=*fimbriata*, M. and H.]

II. No mid-dorsal series of enlarged denticles in the adult.

A. Dermal denticles not carinate, a large patch on lower surface between pectoral fins; distance from anterior angle to posterior end of base of pectoral $\frac{1}{2}$ or nearly $\frac{1}{2}$ the extreme length of the fin ... ... *squatina*, Linn. [=*angelus*, Dum.]

B. Dermal denticles 3–7 carinate, none on lower surface between pectoral fins; distance from anterior angle to posterior end of base of pectoral a little more than $\frac{1}{3}$ the extreme length of the fin.

1. Width of spiracle equal to or less than diameter of eye, its anterior margin fringed; lobes of caudal fin (in adult) more or less acutely pointed ... ... *oculata*, Bonap.

2. Width of spiracle greater than diameter of eye, its anterior margin not fringed; lobes of caudal fin (in adult) more obtusely pointed ... ... *africana*, Regan

TORPEDINIDAE

Torpedo torpedo (Linn.).

Torpedo narce, Günther, 1870, *Cat. Fish.*, VIII, p. 449; Pellegrin, 1914, *Ann. Inst. océanogr. Monaco*, VI (4), p. 8.

Narcacion torpedo, Garman, 1913, *Mem. Mus. Comp. Zoöl.*, XXXVI, p. 306.

Torpedo torpedo, Lozano Rey, 1928, *Fauna Ibérica, Peces*, p. 518, pl. ix, fig. 1.

[1] 1915, *Ann. Mag. Nat. Hist.* (8) XV, p. 124.

[2] 1919, *Trop. Atlant. Vissch.*, p. 191.

St. 274. 4. viii. 27. Off St Paul de Loanda, Angola. Large otter trawl, 64–65 m.: 4 specimens, 180–260 mm.

Hab. Mediterranean and neighbouring parts of the Atlantic.

RAJIDAE

Raja miraletus, Linn.

St. 274. 4. viii. 27. Off St Paul de Loanda, Angola. Large otter trawl, 64–65 m.: 2 male specimens, 435, 440 mm.

Raja sp.

St. 272. 30. vii. 27. Off Elephant Bay, Angola. Large otter trawl, 73–91 m.: one empty egg-capsule.

SYNODONTIDAE

Saurida parri, Norman.

1935, *Proc. Zool. Soc.*, p. 126, fig. 15.

St. 274. 4. viii. 27. Off St Paul de Loanda, Angola. Large otter trawl, 64–65 m.: 2 specimens, 37, 115 mm.[1]

St. 279. 10. viii. 27. Off Cape Lopez, French Congo. Large otter trawl, 58–67 m.: 12 specimens, 80–125 mm.

Hab. Off the coasts of Angola and French Congo.

MURAENIDAE

Muraena unicolor (Delaroche).

St. 271. 30. vii. 27. Off Elephant Bay, Angola. Shore collection: 1 specimen, 355 mm.

This fish is in rather poor condition, but appears to belong to this species.

Muraena sp.

St. 283. 14. viii. 27. Off Annobon, Gulf of Guinea. Large dredge, 18–30 m.: 14 specimens, 40–120 mm.

GADIDAE

Bregmaceros maclellandi, Thompson.

Norman, 1930, *Discovery Reports*, II, p. 339.

St. 274. 4. viii. 27. Off St Paul de Loanda, Angola. Large otter trawl, 64–65 m.: 1 specimen, 51 mm.

ZEIDAE

Zeus faber, Linn.

St. 272. 30. vii. 27. Off Elephant Bay, Angola. Large otter trawl, 73–91 m.: 3 specimens, 240–290 mm.

SERRANIDAE

Epinephelus goreensis (Cuv. and Val.).

St. 271. 30. vii. 27. Elephant Bay, Angola. Hand line, 18 m.: 2 specimens, 265, 345 mm.

Epinephelus aeneus (Geoffr.).

St. 272. 30. vii. 27. Off Elephant Bay, Angola. Large otter trawl, 73–91 m.: 1 specimen, 600 mm.

[1] The larger of these is the holotype.

Neanthias accraensis, Norman.

1931, *Ann. Mag. Nat. Hist.* (10) VII, p. 354, fig. 2.

St. 279. 10. viii. 27. Off Cape Lopez, French Congo. Large otter trawl, 58–67 m.: 1 specimen, 130 mm.

This species was known previously only from the Gold Coast. In life the belly is said to be silvery and the upper part of the body darker. The head is ornamented with 3 or 4 broad oblique yellow bands. The median fins are mottled with yellow, and the soft dorsal is fringed with red.

Rhegma guineensis, sp.n.

St. 283. 13. viii. 27. Off Annobon, Gulf of Guinea. Large dredge, 18–20 m.: 1 specimen, 29 mm.

Very close to *R. thaumasium*, Gilbert, from the Pacific coast of Panama, but without supraocular tentacles. Depth of body about $3\frac{1}{3}$ in the length, length of head $2\frac{1}{2}$. Snout shorter than eye, diameter of which is 4 in length of head and more than twice the

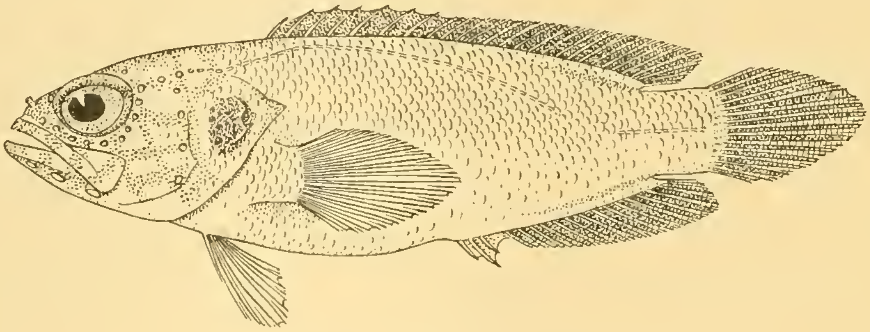

Fig. 2. *Rhegma guineensis*.[1] Holotype. ×4.

interorbital width. Maxillary extending to a very little beyond posterior margin of eye; lower jaw a little projecting; no distinct canine teeth in jaws, but some of the anterior teeth apparently somewhat enlarged. A single broad spine on the praeoperculum; two broad, flat spines embedded in the operculum. About 5 gill-rakers on lower part of anterior arch. 48 (?) scales in lateral line. Dorsal VII 20. Anal III 16 or 17. Pectoral extending nearly to above first anal spine, a little shorter than head. Brownish above, rather paler below; a round dark spot, a little smaller than the eye, on the operculum; sides of head with traces of two dark lines; dorsal, anal and caudal fins blackish; other fins paler.

One other species of this genus has been described, namely *Caribrhegma gregoryi*, Breder, from the Glover Reef off the coast of British Honduras. In this species supraocular tentacles are present, and the dorsal has 15 soft-rays, the anal 12. The two flat spines on the operculum said to be characteristic of *Caribrhegma* are to be found also in *Rhegma thaumasium*, and the other differences mentioned by Breder seem to be only of specific importance.

[1] The course of the lateral line shown in the figure is doubtful, as most of the scales are missing in this region.

CHILODIPTERIDAE

Genus Synagrops, Günther

Melanostoma (*non* Schiner), Steindachner and Döderlein, 1884. Type *M. japonicum*, Steind. and Döderl.

Synagrops, Günther, 1887. Type *Melanostoma japonicum*, Steind. and Döderl.

Parascombrops, Alcock, 1889. Type *P. pellucidus*, Alcock.

Hypoclydonia, Goode and Bean, 1895. Type *H. bella*, Goode and Bean.

Maccullochina, Jordan, 1922. Type *Synagrops serratospinosa*, Smith and Radcliffe.

Key to the species[1]

I. Fin-spines all without serrae. [*Synagrops.*]

A. About 30 scales in lateral line; depth $3\frac{3}{4}$ to more than 4 in length; eye 3 to $3\frac{1}{3}$ in head; anal II 7.

1. Maxillary to below centre of eye, $2\frac{1}{4}$ to $2\frac{1}{3}$ in head ... ... *bellus* (Goode and Bean)
2. Maxillary to below anterior margin of pupil, $2\frac{1}{2}$ in head *japonicus* (Steind. and Döderl.)

B. About 40 scales in lateral line; depth $3\frac{1}{3}$ to $3\frac{1}{2}$ in length; eye $3\frac{1}{3}$ to $3\frac{3}{4}$ in head; anal II 9 *microlepis*, sp.n.

II. Spines of pelvics and sometimes anterior spines of dorsal and anal with serrae on outer edges. [*Parascombrops.*]

A. Only pelvic spines with serrae; snout nearly as long as eye; depth $3\frac{3}{4}$ to 4 in length *philippinensis* (Günth.)

B. Anterior spines of dorsal and anal as well as spines of pelvics with serrae; snout much shorter than eye; depth 3 to $3\frac{1}{8}$ in length ... ... *serratospinosus*, Smith and Radcl.

Through the courtesy of the United States National Museum, I have been able to examine an authentic specimen of *S. japonicus* from Suruga Bay ('Albatross', No. 51434, 100 mm.). I have also seen 4 specimens of *S. bellus* from the Dry Tortugas, Florida, received through the kindness of Dr W. H. Longley, and have included a redescription of that species here. *S. japonicus* and the two species of the subgenus *Parascombrops* have recently been redescribed by Fowler,[2] and full synonymies will be found in his paper.

Synagrops bellus (Goode and Bean).

Hypoclydonia bella, Goode and Bean, 1895, *Ocean. Ichth.*, p. 236, fig. 237; Jordan and Evermann, 1896, *Bull. U.S. Nat. Mus.*, XLVII (1), p. 1115, fig. 475.

Depth of body $3\frac{3}{4}$ to $3\frac{4}{5}$ in the length, length of head about 3. Snout a little more than $\frac{1}{2}$ as long as eye, diameter of which is 3 to $3\frac{1}{3}$ in length of head and a little greater than interorbital width. Maxillary extending to below middle of eye, length $2\frac{1}{4}$ to $2\frac{1}{3}$ in that of head; lower jaw projecting. Upper jaw with broad bands of minute villiform teeth, which are separated at the symphysis, and with a pair of strong, slightly curved canine teeth anteriorly. Lower jaw with a marked concavity anteriorly on each side of the symphysis; anterior part of jaw with bands of minute villiform teeth, and with a

[1] *Synagrops natalensis*, Gilchrist, from Natal, has been very briefly described, but is probably identical with *S. japonicus*.

[2] 1930, *Bull. U.S. Nat. Mus.*, C (10), p. 136.

pair of symphysial canines of moderate size; sides of each mandible with 4 to 6 strong canines, of which the two hindermost are largest and about as large as those of the upper jaw; some minute teeth between and posterior to the lateral canines; a triangular patch of villiform teeth on the vomer and a band of similar teeth, tapering behind, on each palatine. Praeoperculum finely serrated along hinder and lower edge; upper part of operculum with two feeble, flat spines. Gill-rakers of moderate length and rather stout; 13 to 15 on lower part of anterior arch. Scales thin, cycloid; 29 (?) in a longitudinal series; lateral line high up on body, with a gradual curve which nearly follows the outline of the back. Dorsal IX, I 9; interspace between the two fins $\frac{3}{5}$ to $\frac{2}{3}$ diameter of eye. Anal II 7; first spine about $\frac{1}{3}$ as long as second, which is 4 to $4\frac{2}{3}$ in length of head. Pectoral with 16 or 17 rays, length $\frac{2}{3}$ to $\frac{3}{4}$ that of head. Pelvic I 5; spine without serrae; origin a little in advance of pectoral base. Caudal forked; caudal peduncle about $2\frac{1}{4}$ times as long as deep. A black blotch on upper part of spinous dorsal fin.

Hab. Atlantic coast of tropical America, in deep water.

Described from 4 specimens, 90–133 mm. in total length, from the Dry Tortugas, Florida.

This species proves to be very close to *S. japonicus*, but appears to have a somewhat larger mouth. It is possible that the two species will eventually have to be united.

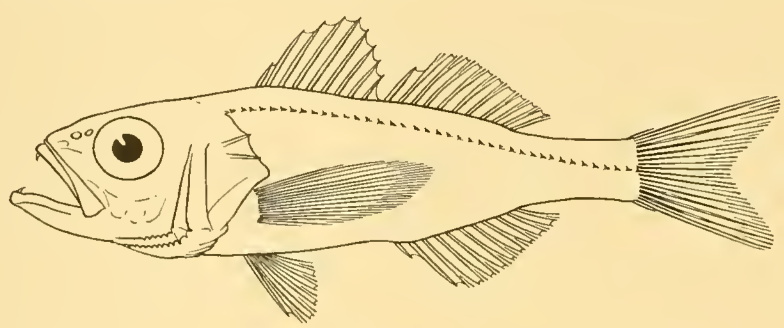

Fig. 3. *Synagrops microlepis.* Holotype. ×2.

Synagrops microlepis, sp.n.

St. 274. 4. viii. 27. Off St Paul de Loanda, Angola. Large otter trawl, 64–65 m.: 13 specimens, 33–60 mm. (holotype, 50 mm.)

Closely related to the preceding species. Depth of body $3\frac{1}{3}$ to $3\frac{1}{2}$ in the length, length of head $2\frac{1}{3}$ to $2\frac{2}{5}$. Snout about $\frac{4}{5}$ as long as eye, diameter of which is $3\frac{1}{3}$ to $3\frac{3}{4}$ in length of head and very little greater than interorbital width. Maxillary scarcely extending to below middle of eye, length about $2\frac{1}{2}$ in that of head; lower jaw strongly projecting; concavity in the mandible very shallow. Upper jaw with bands of minute villiform teeth, separated at the symphysis by a rather broad interspace, on either side of which are one or two strong, curved canines, sometimes depressible; lower jaw anteriorly with bands of villiform teeth and with one or two pairs of small symphysial canines, laterally with 3 or 4 curved canine-like teeth on each side, continued posteriorly by a short narrow band of minute teeth; a V-shaped patch of small teeth on the vomer and a narrow band of similar teeth on each palatine. Praeoperculum with denticulations

along the lower margin and on lower part of hinder edge; a few denticulations at angle of praeopercular ridge; upper part of operculum with two divergent ridges, terminating posteriorly in thin, flat spines. Gill-rakers slender, of moderate length; 13 or 14 on lower part of anterior arch. Scales cycloid; about 40 in lateral line. Dorsal IX, I 10; the two fins nearly contiguous; fifth spine longest, length $2\frac{1}{3}$ to $2\frac{1}{2}$ in that of head. Anal II 9; first spine very short, second $2\frac{3}{4}$ to $3\frac{1}{2}$ in length of head. Pectoral with 16 or 17 rays; extending to above origin of anal or beyond, length $\frac{3}{4}$ to $\frac{4}{5}$ that of head. Pelvic I 5; spine without serrae; origin below or very little in advance of pectoral base. Caudal peduncle about twice as long as deep. Brownish, with a number of minute dark dots on back and upper parts of sides, which tend to form a dark band on either side of base of dorsal fin, the two bands uniting behind to form a dark patch on upper surface of caudal peduncle; a narrow dark line on either side of base of anal fin and a narrow dark vertical bar at base of caudal; lateral line dusky; dorsal and caudal fins with small dark dots; an indistinct blackish area on distal part of spinous dorsal; other fins pale.

LATILIDAE

Latilus semifasciatus, Norman.

1931, *Ann. Mag. Nat. Hist.* (10) VII, 356, fig. 3.

St. 272. 30. vii. 27. Off Elephant Bay, Angola. Large otter trawl, 73–91 m.: 1 specimen, 215 mm.

This species was known previously only from the holotype, 300 mm. in length, from the Gold Coast. In life there is said to be a "lustrous blue" shade along back at base of dorsal fin. Yellow is present in the neighbourhood of the mouth and orbit.

POMADASIDAE

Pomadasys jubelini (Cuv. and Val.).

Pristipoma jubelini, Steindachner, 1870, *SitzBer. Akad. Wiss. Wien*, LX (1), p. 675, pl. ii.

St. 274. 4. viii. 27. Off St Paul de Loanda, Angola. Large otter trawl, 64–65 m.: 4 specimens, 295–345 mm.

St. 279. 10. viii. 27. Off Cape Lopez, French Congo. Large otter trawl, 58–67 m.: 12 specimens, 35–80 mm.

Hab. Tropical West Africa.

SCIAENIDAE

Otolithus macrognathus (Bleeker).

Steindachner, 1870, *SitzBer. Akad. Wiss. Wien*, LX (1), p. 690, pl. vii.

St. 274. 4. viii. 27. Off St Paul de Loanda, Angola. Large otter trawl, 64–65 m.: 2 specimens, 445, 520 mm.

Hab. Tropical West Africa.

Otolithus senegalensis, Cuv. and Val.

Steindachner, 1870, *t.c.*, p. 687, pl. vi.

St. 274. 4. viii. 27. Off St Paul de Loanda, Angola. Large otter trawl, 64–65 m.: 1 specimen, 395 mm.

Hab. Tropical West Africa.

Sciaena aquila (Lacep.).

[? *Sciaena hololepidota* (Lacep.).]

St. 274. 4. viii. 27. Off St Paul de Loanda, Angola. Large otter trawl, 64–65 m.: 3 specimens, 275–295 mm.

Sciaena angolensis, sp.n.

St. 274. 4. viii. 27. Off St Paul de Loanda, Angola. Large otter trawl, 64–65 m.: 4 specimens, 240–260 mm. (holotype, 240 mm.).

Depth of body $3\frac{3}{5}$ to $3\frac{3}{4}$ in the length, length of head about 3. Snout shorter than eye, diameter of which is $3\frac{2}{3}$ to $3\frac{3}{4}$ in length of head and about $1\frac{1}{3}$ times interorbital width. Snout obtuse and rounded; jaws equal anteriorly; maxillary extending to below middle of eye or a little beyond; 2 pairs of open pores beneath the lower jaw; teeth in villiform bands anteriorly, tapering laterally to a single series; those of outer row in upper jaw

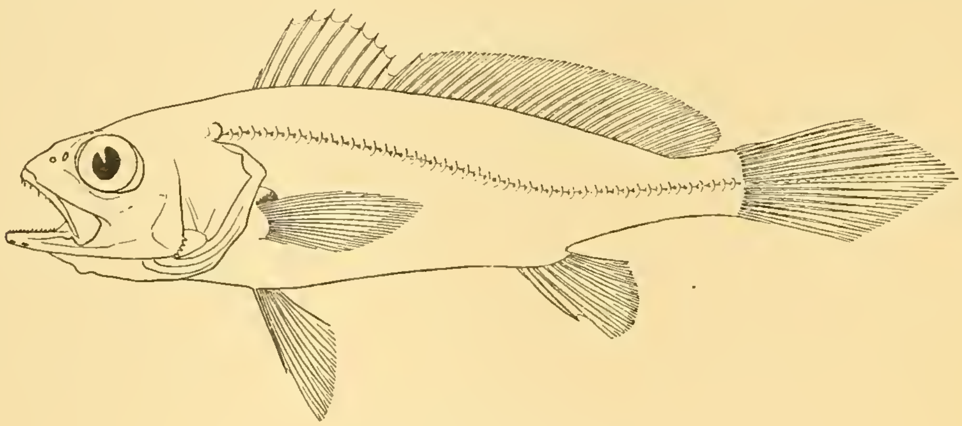

Fig. 4. *Sciaena angolensis*. Holotype. $\times \frac{1}{2}$.

enlarged, becoming canine-like anteriorly; those of inner row of lower jaw moderately enlarged. Margin of praeoperculum with some minute denticulations along posterior edge; angle rounded, with some larger and more distinct teeth; operculum with two weak, flat spines. 9 or 10 gill-rakers of moderate length on lower part of anterior arch. Scales finely ciliated; 47 to 49 in lateral line, 5 or 6 from origin of dorsal to lateral line; lateral line tubules with 3 to 5 short branches. Dorsal IX, I 29–30; spines slender, fourth longest, about $\frac{2}{5}$ length of head; soft dorsal scaled only at base. Anal II 7; first spine very short; second stronger than those of dorsal fin, length more than $\frac{1}{3}$ that of head. Pectoral about $\frac{2}{3}$ length of head. Pelvics shorter, $\frac{3}{5}$ length of head. Caudal pointed, middle rays $\frac{4}{5}$ to $\frac{5}{6}$ as long as head. Silvery; back darker; dusky patches on opercular region; a dark spot superiorly in axil of pectoral; dorsal fins with blackish margins; pectorals, anal and caudal more or less dusky.

Apparently most nearly related to *S. aquila* (Lacepède), differing mainly in the somewhat larger scales, larger eye, pointed caudal fin, etc.

Umbrina ronchus, Valenc.

Umbrina canariensis, Steindachner, 1867, *SitzBer. Akad. Wiss. Wien*, LVI (1), p. 638, pl. vi, fig. 1

Umbrina ronchus, Steindachner, 1882, *Denkschr. Akad. Wiss. Wien*, XLV, p. 8.

St. 272. 30. vii. 27. Off Elephant Bay, Angola. Large otter trawl, 73–91 m.: 4 specimens, 280–370 mm.

Hab. West Africa.

SPARIDAE

Dentex maroccanus (Cuv. and Val.).

Steindachner, 1894, *Notes Leyden Mus.*, XVI, p. 13.

St. 271. 30. vii. 27. Elephant Bay, Angola. Hand line, 18 m.: 2 specimens, 250, 265 mm.

St. 272. 30. vii. 27. Off Elephant Bay, Angola. Large otter trawl, 73–91 m.: 4 specimens, 180–205 mm.

Hab. West Africa.

Dentex macrophthalmus (Bloch).

Günther, 1859, *Cat. Fish.*, I, p. 370.

St. 271. 29. vii. 27. Elephant Bay, Angola. Seine net, 5–0 m.: 2 specimens, 60–88 mm.

Hab. Mediterranean and adjacent seas; West Africa.

Dentex filosus, Valenc.

Steindachner, 1868, *SitzBer. Akad. Wiss. Wien*, LVII (1), p. 975.

St. 272. 30. vii. 27. Off Elephant Bay, Angola. Large otter trawl, 73–91 m.: 1 specimen, 295 mm.

Hab. Coast of Algiers and West Africa; South-east Africa.

Dentex cuninghami, Regan.

St. 272. 30. vii. 27. Off Elephant Bay, Angola. Large otter trawl, 73–91 m.: 3 specimens, 255–320 mm.

St. 274. 4. viii. 27. Off St Paul de Loanda, Angola. Large otter trawl, 64–65 m.: 1 specimen, 120 mm.

Hab. Angola.

Pagellus mormyrus (Linn.).

St. 271. 29. vii. 27. Elephant Bay, Angola. Seine net, 5–0 m.: 2 specimens, 50–60 mm.

Box boops (Linn.).

St. 271. 29. vii. 27. Elephant Bay, Angola. Seine net, 5–0 m.: 10 specimens, 115–135 mm.

Diplodus rondeleti (Cuv. and Val.).

St. 271. 29. vii. 27. Elephant Bay, Angola. Seine net, 5–0 m.: 6 specimens, 80–110 mm.

MAENIDAE

Pterosmaris melanurus (Cuv. and Val.).

Smaris melanurus, Steindachner, 1881, *Denkschr. Akad. Wiss. Wien*, XLIV, p. 26, pl. ii, fig. 2.

St. 271. 29. vii. 27. Elephant Bay, Angola. Seine net, 5–0 m.: 1 specimen, 100 mm.

Hab. Tropical West Africa.

KYPHOSIDAE

Kyphosus incisor (Cuv. and Val.).

Jordan and Evermann, 1898, *Bull. U.S. Nat. Mus.*, XLVII (2), p. 1386.

St. 271. 29. vii. 27. Elephant Bay, Angola. Seine net, 5–0 m.: 3 specimens, 285–295 mm.

Hab. West Indies; Brazil; West Africa (Angola).

The above specimens appear to be identical with one in the British Museum collection from Rio de Janeiro, so that, like *K. sectatrix* (Linn.), this species is found on both sides of the Atlantic. It differs from *K. sectatrix* in having a longer anal fin, with 13 soft-rays, longer pelvics, smaller scales above the lateral line, and a different coloration. *K. gallvei*, Cunningham, from St Helena, is doubtfully distinct from *K. sectatrix*, which has been recorded from Madeira and the Canary Islands on the eastern side of the Atlantic.

LABRIDAE

Julis atlantica, (Günther).

Coris atlantica, Günther, 1864, *Cat. Fish.*, IV, p. 197.

St. 283. 13. viii. 27. Annobon Island, Gulf of Guinea. Hand line: 1 specimen, 250 mm.

Hab. Cape Verde Islands; West Africa.

In life the body is said to be coloured a brilliant ultramarine blue, with some green patches; red about the cheeks and at base of dorsal fin.

TRICHIURIDAE

Trichiurus lepturus, Linn.

St. 274. 4. viii. 27. Off St Paul de Loanda, Angola. Large otter trawl, 64–65 m.: 2 specimens, 225, 960 mm.

GOBIIDAE

Periophthalmus barbarus (Linn.).

9. viii. 27. French Congo. Shore collection: 9 specimens, 65–155 mm.

Gobius (Gobius) angolensis, sp.n.

St. 274. 4. viii. 27. Off St Paul de Loanda, Angola. Large otter trawl, 64–65 m.: 37 specimens, 37–100 mm. (holotype, a male, 95 mm.).

Body moderately compressed, depth 4 to $4\frac{1}{4}$ in the length, length of head 3 to $3\frac{1}{5}$. Breadth of head usually rather less than its depth, which is $\frac{2}{3}$ to $\frac{3}{4}$ of its length. Snout short and obtuse, as long as or rather shorter than eye, diameter of which is $3\frac{1}{4}$ to about 4 in length of head; interorbital space very narrow. Jaws equal anteriorly; maxillary extending to below anterior part of eye; no distinct canine teeth; tongue truncate or slightly bilobate. Head naked, except for 3 or 4 scales on upper part of operculum; nape scaled, with a shallow median groove; body covered with ciliated scales, 27 to 29 in a longitudinal series, 7 or 8 (occasionally 9) in a transverse series between second dorsal and anal fins; breast scaled. Cutaneous papillae of head well developed, the principal series arranged as in the accompanying diagram. Dorsal VI, I 11–12; the two fins narrowly separated; second or second and third rays of first dorsal more or less prolonged and filamentous in males, as long as or longer than head; second dorsal and anal elevated. Anal 11–12. Caudal obtusely pointed, longest rays about as long as head. Pectoral a little shorter than head. Length of pelvics about $\frac{2}{3}$ the distance from their base to the anal fin. Yellowish brown, with two broad dusky patches on back and sides, one below each dorsal fin; usually a black spot or vertical bar at base of caudal; first dorsal and anal dusky; second dorsal and caudal with dark bars separated by narrower pale (yellow in life) interspaces; pectorals and pelvics dusky.

This species is most nearly related to *G. niger*, Linn., of which *G. jozo*, Linn. is probably a synonym, and to *G. roulei*, De Buen. From both species it may be distinguished by the larger head, fewer scales in a longitudinal series (27–29 instead of 33–39), the long filamentous rays of the first dorsal fin in the male, the number and arrangement of the cutaneous papillae on the head, particularly in the nuchal and infraorbital series, and by the coloration. Further, in *G. niger* and *G. roulei* the nape is completely or almost completely without scales.[1] From *G. maindroni*, Sauvage, from Senegal, Sierra Leone and Niger, it may be distinguished by the larger head and eye and by the coloration.

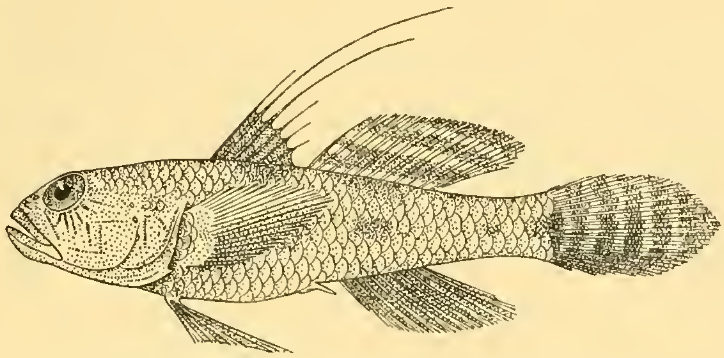

Fig. 5. *Gobius* (*Gobius*) *angolensis*. Holotype. × 1.

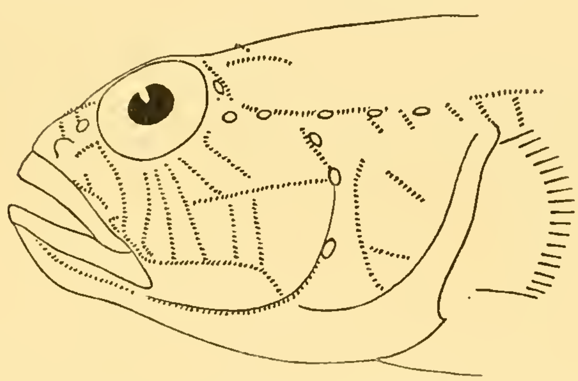

Fig. 6. Diagrammatic view of head of *Gobius* (*Gobius*) *angolensis*, showing the arrangement of the series of cutaneous papillae.

Gobius, sp.

St. 283. 13. viii. 27. Off Annobon, Gulf of Guinea. Large dredge, 18–30 m.: 2 specimens, 17, 18 mm.

Acentrogobius koumansi, sp.n.

St. 274. 4. viii. 27. Off St Paul de Loanda, Angola. Large otter trawl, 64–65 m.: 44 specimens, 30–100 mm. (holotype, 100 mm.).

St. 279. 10. viii. 27. Off Cape Lopez, French Congo. Large otter trawl, 58–67 m.: 6 specimens, 90–105 mm.

[1] An example of this species was sent to Dr Fernando de Buen of Madrid, who has made a special study of the Gobies of this subgenus, and I am greatly indebted to him for his opinion as to its relationships.

Body compressed, depth $4\frac{1}{5}$ to $4\frac{2}{3}$ in the length, length of head 3 (young) to $3\frac{1}{2}$. Breadth of head much less than its depth, which is about $\frac{2}{3}$ of its length. Snout short, rounded, shorter than eye, diameter of which is $2\frac{3}{4}$ (young) to $3\frac{1}{3}$ in length of head; interorbital space very narrow, the eyes being nearly contiguous in the young. Mouth oblique, the jaws equal anteriorly or lower a little prominent; maxillary extending to below middle of eye; both jaws with several rows of teeth, those of the outer row enlarged, those of the innermost row a little enlarged; teeth of outer row of upper jaw stronger than those of lower, forming more or less distinct curved canines; no canines

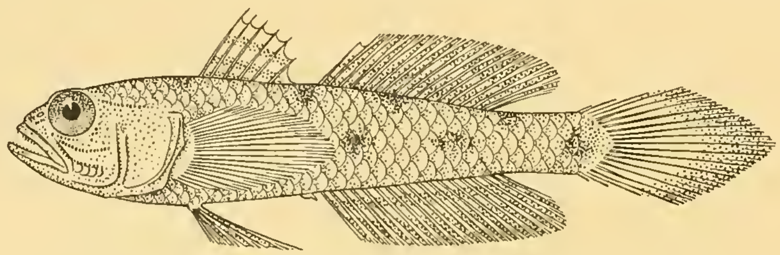

Fig. 7. *Acentrogobius koumansi.* Holotype. ×1.

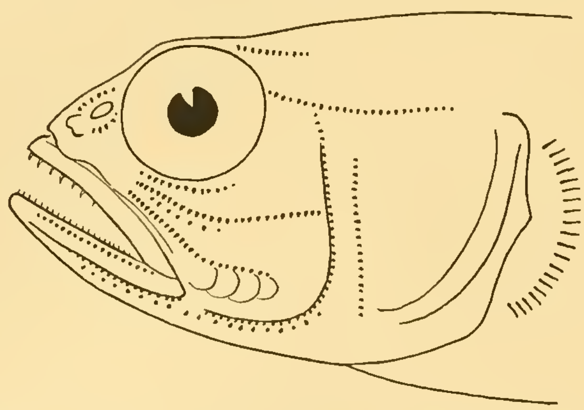

Fig. 8. Diagrammatic view of head of *Acentrogobius koumansi*, showing the arrangement of the series of cutaneous papillae.

in lower jaw; tongue truncate or slightly bilobate. Head naked except on upper surface behind eyes and on lower part of cheek, where there is a row of 3 or 4 scales; body covered with finely ciliated scales; 25 to 27 in a longitudinal series, 7 or 8 in a transverse series between second dorsal and anal fin; breast scaled. Cutaneous papillae on head well developed, arranged as in the accompanying diagram. Dorsal VI, I 16–17; the two fins narrowly separated; second, third and fourth rays of first dorsal sometimes a little prolonged, longest nearly as long as head (males ?); second dorsal and anal elevated. Anal 18–20. Caudal pointed, the middle rays longer than the head. Pectoral without free, silk-like rays, nearly as long as head. Pelvics extending nearly to vent. Yellowish brown, with about 5 dark spots along each side and usually with traces of a row of similar spots along back just below dorsal fins; fins more or less dusky distally; indistinct greyish bars on spinous dorsal.

According to Koumans' synopsis of the genera of Gobiinae (1931) this species must be placed either in *Oxyurichthys* or in *Acentrogobius*.[1] It resembles certain species of *Oxyurichthys*, especially in the large mouth, number of dorsal and anal rays, pointed caudal, etc., but differs in the form of the dentition. It fits much better into *Acentrogobius*, as defined by Koumans, and the diagnosis of that genus may be amended for its reception. It appears to be related to *A. schlegeli* (Günther), from which it may be readily distinguished by the different dentition, the larger eye, and the greater number of dorsal and anal rays.

BLENNIIDAE

Blennius velifer, sp.n.

St. 271. 30. vii. 27. Elephant Bay, Angola. Shore collection. 17 specimens (12 males, 5 females), 25–50 mm. (holotype, a male, 50 mm.).

Depth of body $4\frac{3}{5}$ to 5 in the length, length of head about 4. Snout obtuse, the anterior profile steep in males, less abrupt in females. Diameter of eye $3\frac{2}{3}$ to more than

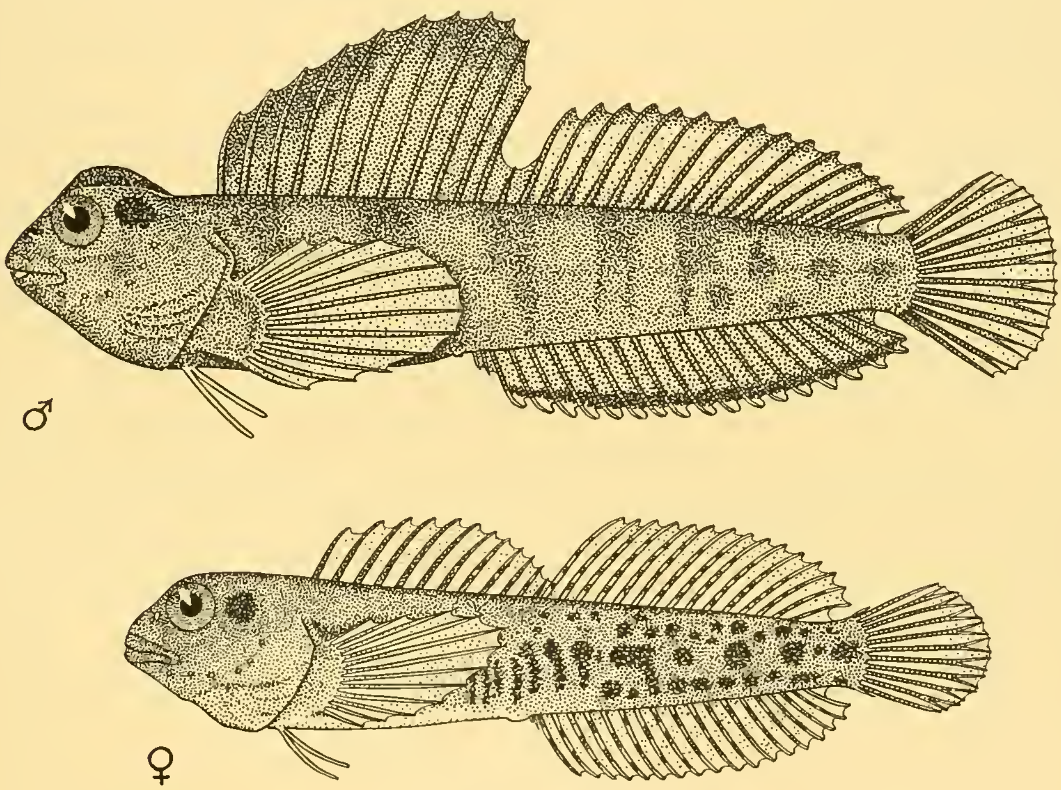

Fig. 9. *Blennius velifer*. ×3.

4 in length of head and greater than interorbital width. Maxillary extending to below anterior part or middle of eye; two large canines in lower jaw and usually two smaller ones in the upper jaw. A small simple tentacle at each anterior nostril; no orbital tentacles; no occipital tentacles or filaments, but males with a well-marked occipital

[1] I am greatly indebted to Dr F. P. Koumans for his kindness in examining a specimen of this species, and for his opinion as to its probable systematic position. He has also examined an example of *Gobius angolensis*.

crest. Dorsal XII 14–15; distinctly notched; commencing above upper angle of gill-opening and ending just before the caudal; spinous portion higher than soft portion in males, rather lower than soft part in females. Anal 16–20. Caudal rounded. Pectoral as long as or longer than head, not or scarcely extending to above origin of anal. Males with traces of dark cross-bars on sides, and with some large dark spots on caudal region of body; a round black spot immediately behind the eye; spinous part of dorsal chocolate brown; anal with a narrow dark submarginal band, each ray tipped with white; females with numerous dark spots on hinder part of body, and with irregular cross-bars anteriorly; a dark spot behind the eye as in males; anal fin spotted with brown.

This species appears to be most nearly related to *B. trigloides*, Cuv. and Val., and *B. bufo*, Lowe.

Blennius, sp.

St. 274. 4. viii. 27. Off St Paul de Loanda, Angola. Net (4 mm. mesh) attached to back of trawl, 64–65 m.: 1 specimen, 23 mm.

This is perhaps the young of *B. ocellaris*, Linn., but appears to have a deeper body and rather fewer rays in the dorsal fin (XI 13).

BROTULIDAE

Brotula barbata (Schn.).

Regan, 1915, *Ann. Mag. Nat. Hist.* (8) xv, p. 128.

St. 272. 30. vii. 27. Off Elephant Bay, Angola. Large otter trawl, 73–91 m.: 2 specimens, 510, 560 mm.

SCORPAENIDAE

Scorpaena canariensis (Sauvage).

St. 274. 4. viii. 27. Off St Paul de Loanda, Angola. Large otter trawl, 64–65 m.: 2 specimens, 60, 130 mm.

See description below.

Scorpaena angolensis, sp.n.

St. 271. 29. vii. 27. Elephant Bay, Angola. Large fish-trap, 20 m.: 1 specimen, 80 mm.

See description below.

Revision of the Scorpaenidae of the Mediterranean and neighbouring parts of the Atlantic

The difficulty experienced in identifying the Scorpaenids collected by the 'Discovery' has led me to undertake an examination of all the species occurring in the Mediterranean and in the eastern Atlantic. Previous authors have found it difficult to ascertain the limits of the genera found in the Atlantic, and my own work has shown quite clearly that, in order to arrive at any definite conclusions concerning the subdivision of the family, a thorough revision of the species of the world will be necessary. It follows, therefore, that the arrangement adopted here is a tentative one, and although I have succeeded in obtaining a satisfactory idea as to the species found in the region under consideration, the grouping of these into genera is open to criticism.

Key to the Genera

I. 30 to 31 vertebrae; dorsal with 15 spines, anal with 7 or 8 soft-rays; spines on upper surface of head feeble; no distinct suborbital ridge; interorbital space flat; head densely scaled; pectoral with narrow base, some of its rays branched ... ... *Sebastes.*

II. 24 to 26 vertebrae; dorsal with 11 to 13 spines, anal with 5 soft-rays; a more or less distinct suborbital ridge, generally armed with spines.

A. Dorsal continuous, though somewhat notched, the penultimate spine at least $\frac{1}{2}$ as long as the last; second anal spine generally longer than third; interorbital space always more or less concave, its width less than diameter of eye.

1. Dorsal with 13 spines; palatines without teeth ... ... *Scorpaenodes.*

2. Dorsal with 12 (occasionally 11 or 13) spines; palatines with teeth.

a. Pectoral with all the rays simple, and with narrow base; 13 or 14 gill-rakers on lower part of anterior arch; head more or less scaled ... ... *Pontinus.*

b. Pectoral with some of the rays branched (except in very young), and with broad base.

α. Gill-rakers of moderate length, 16 to 22 on lower part of anterior arch; lower rays of pectoral free from membrane for at least $\frac{1}{3}$ of their length, and upper part of hinder edge of fin truncate; suborbital ridge smooth or with one small spine. *Helicolenus.*

β. Gill-rakers rather short and stout, 9 to 12 on lower part of anterior arch; lower rays of pectoral free from membrane only at their tips, and hinder edge of fin evenly rounded; suborbital ridge generally armed with spines *Scorpaena.*

B. Dorsal deeply notched, the penultimate spine only about $\frac{1}{3}$ as long as the last; second anal spine much shorter than third; interorbital space flat, its width greater than diameter of eye; pectoral with 20 or more rays, some of them branched; dorsal with 12 spines; lateral line a naked groove with prominent tubes ... ... *Setarches.*

Genus Sebastes, Cuvier

1829, *R. Anim.*, ed. 2, II, p. 166. Type *Perca norvegica*, Ascan.

Eusebastes, Sauvage, 1878, *Nouv. Arch. Mus. H.N. Paris* (2) I, p. 115. Type *Sebastes septentrionalis*, Gaimard.

As now restricted, this genus includes only two species in the North Atlantic: *S. marinus* (Linn.) and *S. viviparus*, Krøyer. These have been regarded by many authors as identical, but, according to Swenander,[1] Jensen,[2] Duncker,[3] Saemundsson[4] and others, the species are valid.

Genus Scorpaenodes, Bleeker

1857, *Nat. Tijdschr. Ned.-Ind.*, XIII, p. 371; 1876, *Versl. Akad. Wet. Amsterdam* (2) IX, p. 296. Type *Scorpaena polylepis*, Bleeker.

Scorpaenodes africanus, Pfaff.

1933, *Vid. Medd. Dansk nat. For.*, XCIV, p. 311, fig. 13.

Hab. Senegal.

Known only from the holotype, 65 mm. in total length, from Dakar.

[1] 1906, *Kgl. Norske Vidensk. Selsk. Skr.* (1905), No. 9, p. 7.
[2] 1922, *Vid. Medd. nat. For. Kjöbenhavn*, LXXIV, p. 105.
[3] 1927, in Grimpe and Wagler, *Tierwelt Nord- u. Ostsee*, Lief. X, Teil XII, Heft 2, p. 2.
[4] 1932, in Joubin, *Faun. Ichth. Atlant. Nord*, X, figs.

Genus Pontinus, Poey

1858, *Mem. Hist. Nat. Cuba*, II, p. 172. Type *Pontinus castor*, Poey.
Sebastoplus, Gill, 1863, *Proc. Acad. Nat. Sci. Philad.*, p. 208. Type *Scorpaena kuhli*, Bowdich.

Poey described two species of the genus *Pontinus*, *P. castor* and *P. pollux*, both probably shallow-water forms from the West Indies. I have not examined specimens of either species, and follow Goode and Bean in regarding them as congeneric with *Scorpaena kuhli*, Bowdich, which is the type of Gill's genus *Sebastoplus*. The genus does not occur in the Mediterranean, and there are only two species in the eastern Atlantic, which may be distinguished as follows:

I. 5 or 6 series of scales between last soft-ray of dorsal and lateral line, 9 to 11 on cheek below suborbital ridge ... ... *kuhli*.
II. 3 series of scales between last soft-ray of dorsal and lateral line, 6 or 7 on cheek below suborbital ridge ... ... *accraensis*.

Sebastes nigropunctatus, Günther, from St Helena, is a *Pontinus*, and may be distinguished from both the above by the form of the dorsal spines, none of which are elongate, and by the coloration. Several species have been described from the western Atlantic, but these are not represented in the British Museum collection.[1]

Pontinus kuhli (Bowdich).

Scorpaena kuhlii, Bowdich, 1825, *Excur. Madeira*, p. 123.
Sebastes kuhlii, Lowe, 1839, *Trans. Zool. Soc.*, II (3), p. 176; Lowe, 1860, *Hist. Fish. Madeira*, p. 115, pl. xvii; Günther, 1860, *Cat. Fish.*, II, p. 102; Steindachner, 1867, *SitzBer. Akad. Wiss. Wien*, LVI (1), p. 671; Capello, 1881, *Mem. Acad. Sci. Lisboa*, XLVI (N.S. VI, pt. 1), p. 11; Vaillant, 1888, *Expéd. Sci. 'Travailleur' et 'Talisman', Poiss.*, p. 370; Vinciguerra, 1893, *Atti Soc. Ital. Sci. Nat. Milano*, XXXIV, p. 312; Collett, 1896, *Rés. Camp. Sci. Monaco*, X, p. 13.
Sebastes filifer, Valenciennes, 1843, in Webb and Berthelot, *Canaries* (*Ichth.*), p. 21, pl. ii, fig. 2.[2]
Sebastoplus kuhlii, Gill, 1863, *Proc. Acad. Nat. Sci. Philad.*, p. 208.
Sebastes (*Sebastichthys*) *filifer*, Sauvage, 1878, *Nouv. Arch. Mus. H.N. Paris* (2) I, p. 118.
Pontinus kuhlii, Goode and Bean, 1895, *Ocean. Ichth.*, p. 253.
Pontinus filifer, Goode and Bean, 1895, *t.c.*, p. 254.

Depth of body about 3 in the length, length of head $2\frac{1}{6}$ to $2\frac{1}{4}$. Snout longer than eye, diameter of which is $4\frac{1}{2}$ to 5 in length of head and $1\frac{2}{3}$ to more than twice interorbital width. Two strong, backwardly curved spines on the praeorbital; suborbital ridge with 3 or 4 spines; 5 praeopercular spines, the uppermost strongest and with a smaller spine at its base, the lowermost sometimes wanting. Gill-rakers of moderate length, the longest less than $\frac{1}{2}$ diameter of eye; 13 or 14 (including rudiments) on lower part of anterior arch. Scales spinulose and ciliated; 5 or 6 series between last soft-ray of dorsal and lateral line; breast scaled. Dorsal XII 9–10;[3] generally the second and

[1] *Sebastes nematophthalmus*, Günther (1860, *Cat. Fish.*, II, p. 99) was described from two specimens, a large stuffed one believed to have come from Mauritius, and one in spirit, 165 mm. long, which formed part of a collection made by Sir R. Schomburgk in the West Indies. These appear to represent distinct species. I cannot find any trace of the "long, slender, tapering filament above the posterior angle of the orbit" in the West Indian specimen, which is an undoubted *Pontinus*.

[2] I am indebted to Dr W. H. Longley for notes upon the type of this species in the Paris Museum.

[3] The last ray of both dorsal and anal fins in all Scorpaenids is cleft nearly to its base, and has consequently been counted as two rays by many workers.

third spines much longer than the remainder, but sometimes only the second or only the third elongate; longest spines $1\frac{4}{5}$ to $2\frac{1}{4}$ in length of head. Anal III 5. Pectoral with 16 or 17 rays, the lower ones a little thickened and free from membrane at their tips; fin extending to a little beyond vent. Pale brownish, the upper parts of the sides spotted with darker brown, the spots sometimes tending to form irregular longitudinal rows; dorsal and sometimes the caudal fin spotted with brown; other fins nearly uniform.

Hab. Coast of Portugal; Madeira; Canaries; Azores; etc.

In the British Museum 10 specimens, 210–320 mm. in total length.

Sebastes (*Sebastichthys*) *bibroni*, Sauvage,[1] described from a single specimen 208 mm. in total length from Sicily, seems to belong to this genus. Dr W. H. Longley has kindly examined the type in the Paris Museum for me, and reports that the pectoral rays (18) are all simple and that there are 13 gill-rakers (including rudiments) on the lower part of the anterior arch, the longest being more than $\frac{1}{2}$ the diameter of the eye. The length of the first dorsal spine is 13 mm., the second 36 mm., the third 34 mm., and the fourth 25 mm. It is possible that this species will prove to be identical with *Pontinus kuhli*, to which it is obviously very closely related, but I have hesitated to unite the two forms, especially in view of the fact that *P. kuhli* has not been recorded from the Mediterranean.

Pontinus accraensis, sp.n.

Closely related to *P. kuhli*. Depth of body about 3 in the length, length of head a little more than 2. Snout very little longer than eye, diameter of which is about 4 in length of head and $2\frac{1}{2}$ times the interorbital width. The spines above the anterior angles of the orbits are directed upwards and outwards instead of posteriorly; the second praeopercular spine is considerably stronger, this being generally very inconspicuous in *P. kuhli*, and the fourth has three points. 12 gill-rakers on lower part of anterior arch. 3 series of scales between last soft-ray of dorsal and lateral line, 6 or 7 on cheek below suborbital ridge. Dorsal XII 9; only the second spine elongated, length $2\frac{4}{5}$ in that of head. Anal III 5. Pectoral with 17 rays. The dark spots on the upper part of the body are more distinct, and there is a row of spots along the lateral line; the caudal as well as the soft dorsal fin is ornamented with small dark spots.

Hab. Accra, Gold Coast.

Only the holotype known, a specimen 215 mm. in total length collected and presented to the British Museum by Dr F. R. Irvine in 1930.

Genus **Helicolenus**, Goode and Bean

1895, *Ocean. Ichth.*, p. 248. Type *Scorpaena dactyloptera*, Delaroche.

There appear to be four species of this genus in the Mediterranean and Atlantic, one of which (*H. maderensis*) occurs only off the American coast, and another at the Cape. The other two may be distinguished as follows:

I. Diameter of eye $2\frac{3}{4}$ to 4 in head (in specimens of 145 to 230 mm.); only one or two pairs of spines on occipital region; body uniformly coloured or with irregular dark markings on upper parts of sides ... ... *dactylopterus*.

[1] 1878, *Nouv. Arch. Mus. H.N. Paris* (2) 1, p. 116, pl. i, fig. 3.

II. Diameter of eye $3\frac{3}{4}$ to 4 in head (in specimens of 63 and 103 mm.); 3 pairs of spines on occipital region; body mottled with dark brown ... ... *microphthalmus*.

Helicolenus dactylopterus (Delaroche).

? *Scorpaena malabarica*, Schneider, 1801, in Bloch, *Syst. Ichth.*, p. 194.

Scorpaena dactyloptera, Delaroche, 1809, *Ann. Mus. H.N.* (*Paris*), XIII (77), p. 337, pl. xxii, fig. 9; Risso, 1810, *Ichth. Nice*, p. 186; Risso, 1826, *Hist. Nat. Europ. Mérid.*, III, p. 369; Smitt, 1893, *Scand. Fish.*, I, p. 154, fig. 43; Holt and Calderwood, 1895, *Sci. Trans. R. Dublin Soc.* (2) V, p. 409, pl. xlii, fig. 1; Holt and Byrne, 1908, *Fisheries Ireland Sci. Invest.*, 1906, V, p. 9, pl. i; Duncker, 1927, in Grimpe and Wagler, *Tierwelt Nord- u. Ostsee*, Lief. X, Teil XX, Heft 2, p. 4, fig. 2.

Sebastes imperialis, Cuvier, 1829, *R. Anim.*, ed. 2, II, p. 167; Cuvier and Valenciennes, 1829, *Hist. Nat. Poiss.*, IV, p. 336; Lowe, 1839, *Trans. Zool. Soc.*, II (3), p. 175; Lowe, 1860, *Hist. Fish. Madeira*, p. 171, pl. xxiv.

Sebastes kuhlii, Valenciennes, 1843, in Webb and Berthelot, *Canaries* (*Ichth.*), pl. ii, fig. 1.

Sebastes dactylopterus, Günther, 1860, *Cat. Fish.*, II, p. 99; Moreau, 1881, *H.N. Poiss. France*, II, p. 317, fig. 117; Steindachner and Döderlein, 1885, *Denkschr. Akad. Wiss. Wien*, XLIX, p. 201 [*S. hilgendorfi*, Döderlein MS.]; Carus, 1889–93, *Prodr. Faun. Medit.*, II, p. 638; Collett, 1896, *Rés. Camp. Sci. Monaco*, X, p. 12; Roule, 1907, *Arch. Zool. expér. gén.*, (4) VI, *Notes et Revue*, p. xv; Jaquet, 1907, *Bull. Inst. océan. Monaco*, CIX.

Helicolenus dactylopterus (part), Goode and Bean, 1895, *Ocean. Ichth.*, p. 249.

Scorpaena (*Helicolenus*) *dactyloptera*, Fage, 1918, *Rep. Danish Ocean. Exped.* 1908–10, II, A 3, p. 102.

Depth of body $2\frac{4}{5}$ to $3\frac{1}{3}$ in the length, length of head $2\frac{1}{2}$ to $2\frac{2}{3}$. Snout shorter than eye, diameter of which is $2\frac{3}{4}$ to 4 in length of head and 2 to $2\frac{1}{2}$ times interorbital width. Praeorbital spines feeble; suborbital ridge generally smooth, but sometimes a very small spine below posterior edge of eye; 5 praeopercular spines; a spine above the front of each orbit and 3 or 4 above its posterior angle; one or two pairs of spines on the occipital region. Maxillary with a patch of scales in the centre. Gill-rakers of moderate length, the longest $\frac{1}{4}$ to $\frac{1}{3}$ diameter of eye; 16 to 18 on lower part of anterior arch. Scales spinulose and ciliated; about 5 series between last soft-ray of dorsal and lateral line; breast scaled. Dorsal XII (occasionally XIII) 12 (–14); third or fourth spines generally longest, $2\frac{1}{3}$ to nearly 3 (large specimens) in length of head. Anal III 5. Pectoral with 19 rays, the 2 uppermost simple, the next 8 or 9 branched, and the lowermost 8 or 9 simple and sometimes somewhat thickened; fin extending to above vent or a little beyond. Pale yellowish brown (red or pinkish in life), paler below; sometimes with some dark markings forming irregular bars on upper parts of sides, generally more prominent in the young; pharynx blackish or dark brown.[1]

Hab. Mediterranean and adjacent parts of the Atlantic, northwards to Scandinavia, southwards to the Cape Verde Islands; Azores; Japan (?).

In the British Museum numerous specimens, 115–230 mm. in total length.

There are 4 specimens from Japan in the British Museum collection, 145–230 mm. in total length, but all are in somewhat poor condition. After careful comparison I am unable to detect any important differences between these specimens and some of

[1] For a detailed account of the variation in the coloration of this species see Holt and Byrne (1908).

equal size from the Atlantic. *Helicolenus dactylopterus* is said to be common on the western side of the Atlantic, mainly between latitudes 30° and 40° N, but, judging from a single specimen of 122 mm. length, taken by the 'Albatross' in the North-West Atlantic (40° 00′ 15″ N, 70° 55′ 30″ W) at a depth of 136 fathoms, this should be a distinct species, distinguishable by the smaller eye, which is about $3\frac{1}{2}$ in length of head and about twice the interorbital width, less deeply concave interorbital region, and by the constant presence of a small spine on the suborbital ridge. The scales may be a little larger in the American form, but the specimen examined is in a poor state of preservation. The Western Atlantic species will stand as *H. maderensis*, Goode and Bean, a somewhat unfortunate name, as it has been clearly shown that this form does not occur at all on the eastern side of the Atlantic. *H. maculatus* (Cuv. and Val.), from the Cape, is closely related to *H. dactylopterus*, but may be readily distinguished by the rather longer and more numerous gill-rakers (21 or 22), larger scales, and by the coloration.

H. dactylopterus is usually found in fairly deep water, chiefly between 100 and 400 fathoms, but young and half-grown individuals have been recorded from lesser depths. The maximum size of the species appears to be about 24 inches.

Helicolenus microphthalmus, Norman.

1935, *Proc. Zool. Soc.*, p. 612, fig. 1.

Hab. Off Saltburn, Yorks; 30 fathoms.

Known only from the types, 63 and 103 mm. in total length.

Genus Scorpaena, Linnaeus

1758, *Syst. Nat.*, ed. 10, p. 266. Type *Scorpaena porcus*, Linnaeus.

There are numerous species of this genus in all tropical and temperate seas, presenting considerable variation in squamation and in the armature of the head. It seems certain that a careful revision of all the species would reveal definite characters for the subdivision of the genus, and even the few species dealt with here represent a somewhat heterogeneous assemblage. It is probable that the species with the breast naked (*Scorpaena*) will have to be separated from the remainder, and it is very doubtful whether the species described by Koehler as *echinata* (? =*cristulata*, Goode and Bean) should be included.[1] The presence or absence of an occipital pit, originally believed to be of primary importance, proves to be of little value as a generic character, and within the genus every gradation exists between a deep quadrate pit on the occiput and a very shallow depression or none at all.

There appear to be nine species of *Scorpaena* in the Mediterranean and adjacent parts of the Atlantic, of which one was originally described by Sauvage in 1878, but has not since been recognized, and another is described below as new to science.

[1] See p. 32 of this report.

Key to the Mediterranean and Eastern Atlantic Species

I. Breast naked; scales on head not visible, completely embedded in the skin.

A. Scales smooth, but with crenulate margins, small; 6 or 7 between last soft-ray of dorsal and lateral line; spines on suborbital ridge small or wanting ... ... *porcus.*

B. Scales ciliated, sometimes spinulose, larger; 3 to 5 between last soft-ray of dorsal and lateral line; spines on suborbital ridge well developed.

1. Occipital pit present; base of pectoral broad, the lowermost ray inserted level with root of pelvic spine and more or less in advance of uppermost.

a. Pectoral with 18 (occasionally 17 or 19) rays; distance from origin of dorsal to anterior edge of occipital pit equal to or a little greater than eye; snout shorter than eye, which is 3 to $4\frac{1}{5}$ in head.

α. Head $2\frac{1}{3}$ to $2\frac{1}{2}$ in length; pores on head numerous; supraorbital tentacle generally of moderate size or small ... ... *ustulata.*

β. Head $2\frac{1}{4}$ to $2\frac{1}{3}$ in length; pores on head fewer; supraorbital tentacle larger, $\frac{1}{3}$ to $\frac{4}{5}$ eye ... ... *angolensis.*

b. Pectoral with 19 or 20 rays; distance from origin of dorsal to anterior edge of occipital pit $1\frac{1}{2}$ to more than twice eye; snout longer than eye, which is $4\frac{1}{2}$ to $6\frac{3}{4}$ in head *scrofa.*

2. No occipital pit; base of pectoral rather narrow, the lowermost ray inserted a little above level of root of pelvic spine and about opposite uppermost ... *canariensis.*

II. Breast fully scaled; always some scales visible on opercular region, and often on cheek also.

A. Scales all cycloid; a well-developed occipital pit.

1. Depth of head at origin of dorsal $1\frac{1}{4}$ to $1\frac{1}{3}$ in its length; supraorbital tentacle, when present, small; pectoral extending to vent or a little beyond, $1\frac{1}{2}$ to $1\frac{3}{5}$ in head *laevis.*

2. Depth of head at origin of dorsal $1\frac{1}{2}$ in its length; supraorbital tentacle large, $\frac{2}{3}$ to $\frac{3}{4}$ eye; pectoral extending nearly to origin of anal, $1\frac{1}{4}$ in head ... ... *senegalensis.*

B. Scales spinulose and ciliated; no occipital pit.

1. Pectoral with 15 or 16 rays; 2 or 3 rather feeble spines on posterior part of suborbital ridge; head $2\frac{1}{2}$ to $2\frac{3}{4}$ in the length ... ... *madurensis.*

2. Pectoral with 21 or 22 rays; 7 or 8 strong spines on suborbital ridge, which is prominent; head $2\frac{1}{6}$ to $2\frac{1}{3}$ in the length ... ... *echinata.*

Scorpaena porcus, Linnaeus.

1758, *Syst. Nat.*, ed. 10, p. 266; Bloch, 1785, *Nat. ausl. Fische*, III, p. 5, pl. clxxxi; Risso, 1810, *Ichth. Nice*, p. 187; Günther, 1860, *Cat. Fish.*, II, p. 107; Carus, 1889–93, *Prodr. Faun. Medit.*, II, p. 640; Roule, 1907, *Arch. Zool. expér. gén.* (4) VI, *Notes et Revue*, p. xvii; Jaquet, 1907, *Bull. Inst. océan. Monaco*, CIX; Fage, 1918, *Rep. Danish Ocean. Exped.* 1908–10, II, A 3, p. 103.

Cottus massiliensis, Forskal, 1775, *Descr. Anim.*, p. 24.

Scorpaena massiliensis, Lacepède, 1802, *Hist. Nat. Poiss.*, III, pp. 258, 269.

Scorpaena fasciata, Costa, 1850 (?), *Faun. Napoli*, II. *Pesci*, Scorpaena, p. 3, pl. iv.

Depth of body $2\frac{1}{3}$ to nearly 3 in the length, length of head $2\frac{1}{5}$ to $2\frac{2}{5}$. Snout as long as or rather shorter than eye, diameter of which is 4 to 5 in length of head and greater than interorbital width. No visible scales on head, but a number of pores. A deep occipital pit. Spines on praeorbital strong, each with a single point, but those on suborbital ridge feebly developed or wanting. A well-developed supraorbital tentacle,

and a few membranous processes scattered over head. Length of band of palatine teeth about $\frac{2}{3}$ diameter of eye. 11 or 12 gill-rakers on lower part of anterior arch. Scales smooth, with the hinder margins crenulate; 6 or 7 series between last soft-ray of dorsal fin and lateral line; breast naked. Dorsal XII 9; third, fourth and fifth spines longest, $2\frac{1}{5}$ to $3\frac{1}{3}$ in length of head. Anal III 5; third spine as long as or longer than second in adults, second spine longest in immature specimens. Pectoral with 16 or 17 rays, extending to above vent or a little beyond. Reddish brown, variously mottled with darker and dotted with deep black, the dots sometimes margining the darker areas; in smaller specimens the fins decorated with irregular dark spots, blotches and cross-bands; often a black blotch on hinder part of spinous dorsal; pectoral spotted and marbled with dark brown or black, some larger dark spots in the axil.

Hab. Mediterranean and adjacent parts of the Atlantic, straying northwards to the British Isles.

In the British Museum numerous specimens, 38–260 mm. in total length.

Scorpaena ustulata, Lowe.

? Scorpaena notata, Rafinesque, 1810, *Car. N. Gen.*, p 33.

Scorpaena ustulata, Lowe, 1841, *Proc. Zool. Soc.*, VIII (88 and 89), p. 36; Günther, 1860, *Cat. Fish.*, II, p. 110; Bellotti, 1888, *Atti Soc. Ital. Sci. Nat. Milano*, XXXI, p. 213, pl. iv, fig. 1; Carus, 1889–93, *Prodr. Faun. Medit.*, II, p. 641; Moreau, 1891, *H.N. Poiss. France*, Suppl. p. 26; Collett, 1896, *Rés. Camp. Sci. Monaco*, X, p. 10, pl. iv, fig. 15; Roule, 1907, *Arch. Zool. expér. gén.* (4) VI, *Notes et Revue*, p. xxi; Jaquet, 1907, *Bull. Inst. océan. Monaco*, CIX; Fage, 1918, *Rep. Danish Ocean. Exped.* 1908–10, II, A 3, p. 103.

Scorpaena porcus, Costa, 1850 (?), *Faun. Napoli*, II. *Pesci*, Scorpaena, p. 2, pl. iii.

Scorpaena teneriffea, Jordan and Gunn, 1898, *Proc. Acad. Nat. Sci. Philad.*, p. 345.

Depth of body $2\frac{3}{5}$ to 3 in the length, length of head $2\frac{1}{3}$ to $2\frac{1}{2}$. Distance from origin of dorsal to anterior edge of occipital pit equal to or a little greater than diameter of eye. Snout blunt, shorter than eye, diameter of which is 3 to 4 in length of head and about twice the interorbital width. No visible scales on head, but numerous pores, which in preserved specimens give parts of the head a pustulate appearance. A deep occipital pit. Spines on praeorbital strong, the anterior with two points; 4 well-developed spines on suborbital ridge. Supraorbital tentacle generally developed, sometimes small or even absent; its length generally $\frac{1}{4}$ to $\frac{1}{2}$ diameter of eye; sometimes a few membranous processes on head. Length of band of palatine teeth about $\frac{1}{3}$ diameter of eye. 10 to 12 gill-rakers on lower part of anterior arch. Scales spinulose and ciliated; 3 or 4 series between last soft-ray of dorsal and lateral line; breast naked; a few membranous processes sometimes present on body. Dorsal XII 9 (XIII 8 in one specimen); third to fifth spines longest, 2 to $2\frac{1}{3}$ in length of head. Anal III 5; second spine longer and stronger than third. Pectoral with 18 (occasionally 17 or 19) rays, extending to above origin of anal or not quite as far; base broad, the lowermost ray inserted level with root of pelvic spine and more or less in advance of uppermost. Reddish brown; nearly uniform or variously mottled with darker and paler on body and fins; often dotted with black; nearly always a black blotch on hinder part of spinous dorsal fin.

Hab. Mediterranean and adjacent parts of the Atlantic; Azores.

In the British Museum numerous specimens, 65–205 mm. in total length.

Scorpaena angolensis, sp.n.

Closely related to *S. ustulata*, but length of head $2\frac{1}{4}$ to $2\frac{1}{3}$ in that of fish. Diameter of eye $3\frac{1}{2}$ to $4\frac{1}{5}$ in length of head and $1\frac{3}{4}$ to nearly twice interorbital width. Pores on head rather less numerous. Anterior praeorbital spine single or with a very small secondary spine at its base. Supraorbital tentacle larger, branched, its length $\frac{1}{3}$ to $\frac{4}{5}$ diameter of eye; membranous processes well developed on head and others on parts of body, especially in the region of the lateral line. Length of palatine band of teeth $\frac{2}{5}$ or $\frac{1}{2}$ diameter of eye. Dorsal XII 9; fourth and fifth spines longest, about twice in length of head. Anal III 5. Pectoral with 18 rays.

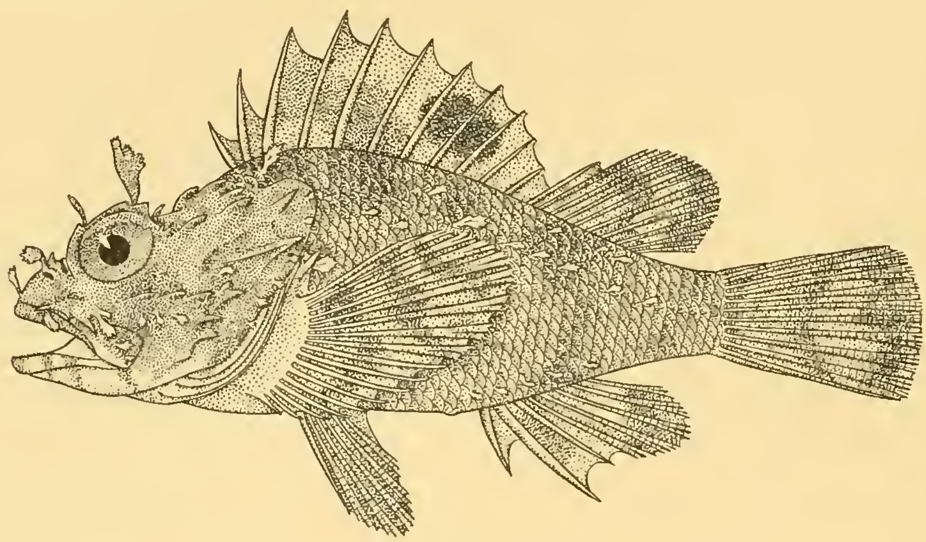

Fig. 10. *Scorpaena angolensis*. St. 271. $\times 1\frac{1}{2}$.

Hab. Coast of Angola.

In addition to the specimen collected by the Discovery Expedition, there are two more in the British Museum collection, 120 and 155 mm. in total length, found among the unidentified Scorpaenids. The larger of these has been selected as the holotype.

S. angolensis is very closely related to *S. ustulata*, and has probably been mistaken for that species. In addition to the differences mentioned in the description, if examples of equal size are compared, *S. angolensis* will be seen to have a more slender body and rather larger mouth.

Scorpaena scrofa, Linnaeus.

Linnaeus, 1758, *Syst. Nat.*, ed. 10, p. 266; Bloch, 1785, *Nat. ausl. Fische*, III, p. 10, pl. clxxxii; Risso, 1810, *Ichth. Nice*, p. 188; Costa, 1850 (?), *Faun. Napoli*, II. *Pesci*, Scorpaena, p. 1, pl. ii; Lowe, 1860, *Hist. Fish. Madeira*, p. 105, pl. xvi; Günther, 1860, *Cat. Fish.*, II, p. 108; Moreau, 1881, *H.N. Poiss. France*, II, p. 310, fig. 116; Day, 1887, *Proc. Zool. Soc.*, p. 342; Carus, 1889–93, *Prodr. Faun. Medit.*, II, p. 639; Roule, 1907, *Arch. Zool. expér. gén.* (4) VI, *Notes et Revue*, p. xix; Jaquet, 1907, *Bull. Inst. océan. Monaco*, CIX; Holt and Byrne, 1908,

Fisheries Ireland Sci. Invest., 1906, v, p. 26, fig.; Fage, 1918, *Rep. Danish Ocean. Exped.* 1908–10, II, A 3, p. 103; Metzelaar, 1919, *Trop. Atlant. Vissch.*, p. 285.

Scorpaena barbata, Lacepède, 1802, *Hist. Nat. Poiss.*, III, p. 259.

Scorpaena lutea, Risso, 1810, *Ichth. Nice*, p. 190; Risso, 1826, *H.N. Europ. Mérid.*, III, p. 371; Roule, 1907, *t.c.*, p. xx.

Scorpaena scrofa var. *obesa*, Lowe, 1860, *t.c.*, p. 105; Goode and Bean, 1895, *Ocean. Ichth.*, p. 245.

Scorpaena scrofa var. *histrio*, Lowe, 1860, *t.c.*, p. 106.

Depth of body $2\frac{2}{3}$ to $3\frac{1}{5}$ in the length, length of head $2\frac{1}{6}$ to $2\frac{2}{5}$. Distance from origin of dorsal to anterior edge of occipital pit $1\frac{1}{2}$ times to more than twice diameter of eye. Snout pointed, longer than eye, diameter of which is $4\frac{1}{2}$ (young) to $6\frac{3}{4}$ in length of head and equal to or as much as $1\frac{1}{3}$ times interorbital width. No visible scales on head, and comparatively few pores. A somewhat shallow occipital pit. Praeorbital spines strong; two smaller intermediary spines between the principal ones; 4 well-developed spines on suborbital ridge. Supraorbital tentacle very variable in size, its length from $\frac{1}{6}$ to $\frac{5}{6}$ diameter of eye; sometimes altogether wanting; membranous processes variously developed on chin, praeorbital, edge of praeoperculum, and on other parts of head. Length of band of palatine teeth $\frac{2}{3}$ to $\frac{4}{5}$ diameter of eye. 10 to 12 gill-rakers on lower part of anterior arch. Scales ciliated; 4 or 5 series between last soft-ray of dorsal and lateral line; breast naked; usually a number of membranous filaments and processes on body, especially in the region of the lateral line and on the back. Dorsal XII 9 (occasionally XIII 8); third or fourth (sometimes fifth) spines longest, $1\frac{4}{5}$ to $2\frac{2}{3}$ (young) in length of head. Anal III 5; second spine subequal to or a little longer than, and stronger than third. Pectoral with 19 or 20 rays, extending to above vent or not as far; base broad, the lowermost ray inserted level with root of pelvic spine and in advance of uppermost. Coloration very variable; generally reddish brown or yellowish, the head, body and fins marbled and spotted with darker brown; in smaller specimens the markings on the fins tend to form irregular cross-bars; often a large black blotch on hinder part of spinous dorsal fin.

Hab. Mediterranean and adjacent parts of the Atlantic, ranging southwards to Madeira and beyond, and straying northwards to the British Isles.

In the British Museum numerous specimens, 140–480 mm. in total length.

This is a very variable species, particularly in the coloration, the size of the supraorbital tentacle, and to some extent in the size of the scales. It is possible that the examination of a large series of examples would lead to the recognition of more than one form. As a general rule, specimens from the eastern Mediterranean appear to have the supraorbital tentacle better developed than those from its western end, but in examples from Madeira the size of the tentacle varies considerably.

Scorpaena canariensis, Sauvage.

Sebastes (*Sebastichthys*) *canariensis*, Sauvage, 1878, *Nouv. Arch. Mus. H.N. Paris* (2) I, p. 117, pl. i, figs. 1, 2.

Pontinus canariensis, Goode and Bean, 1895, *Ocean. Ichth.*, p. 255.

Depth of body 3 in the length, length of head $2\frac{2}{3}$. Snout about as long as eye, diameter of which is nearly 4 in length of head and $1\frac{1}{2}$ times interorbital width. No

visible scales on head, but numerous small pores. No occipital pit. Two strong praeorbital spines, and 3 or 4 on suborbital ridge. Supraorbital tentacle about $\frac{1}{2}$ diameter of eye; other membranous processes at anterior nostril, on praeorbital, and on edge of praeoperculum; a few small processes on upper surface of eyeball. Palatine band of teeth very narrow, its length about $\frac{3}{5}$ diameter of eye. 10 gill-rakers on lower part of anterior arch. Scales ciliated; 3 series between last soft-ray of dorsal and lateral line; breast naked; no membranous processes on body. Dorsal XII 9; third and fourth spines longest, about twice in length of head. Anal III 5; third spine a little longer than second. Pectoral with 18 rays, extending to beyond origin of anal; base rather narrow, the lowermost ray inserted a little above level of root of pelvic spine and about opposite uppermost. Pale yellowish brown, with indistinct, narrow, oblique, greyish stripes

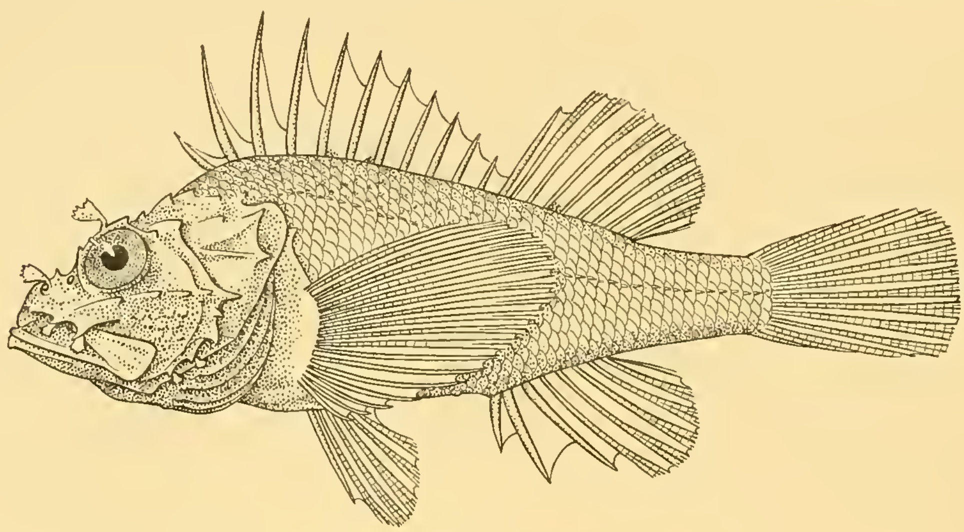

Fig. 11. *Scorpaena canariensis.* × 1.

following the series of scales above the lateral line; fins all yellowish; a small dark spot on the membrane between the bases of the sixth and seventh dorsal spines, another between the seventh and eighth, and another between the third and fourth soft-rays.

Hab. Canary Islands; off the coast of Angola.

This species does not appear to have been recognized since originally described by Sauvage, and I have some doubt whether the examples from Angola are really referable to it. Dr W. H. Longley has sent me some notes on the type of *S. canariensis* (185 mm.) in the Paris Museum, but, although there appear to be some minor differences between this and the specimens described above, I do not think it advisable to give the latter a new name without actual comparison.

Scorpaena laevis, Troschel.

1866, *Arch. Naturgesch.*, XXXII (1), p. 206.

? *Scorpaena senegalensis*, Fowler, 1919, *Proc. U.S. Nat. Mus.*, LVI, p. 214.

Hab. Cape Verde Islands.

A description and figure of this species has been given on p. 6 of this report.

Scorpaena senegalensis, Steindachner.

1881, *Denkschr. Akad. Wiss. Wien*, XLIV, p. 31, pl. iv.

Very closely related to *S. laevis*, but depth of head at origin of dorsal $1\frac{1}{2}$ in its length. Snout longer than eye, diameter of which is $5\frac{1}{4}$ in length of head and about equal to interorbital width. Spines on head generally more acute. Supraorbital tentacle larger and much branched, its length $\frac{2}{3}$ to $\frac{3}{4}$ diameter of eye. Dorsal XII 9. Anal III 5. Pectoral with 19 rays, extending nearly to above origin of anal, its length (measured from upper angle) $1\frac{1}{4}$ in that of head.

Hab. Coasts of tropical West Africa.

In the British Museum 2 specimens, 125 and 280 mm. in total length, from the Niger and the Gold Coast.

Scorpaena madurensis, Cuv. and Val.

1833, *Hist. Nat. Poiss.*, IX, p. 463.

Sebastes maderensis, Lowe, 1839, *Trans. Zool. Soc.*, II (3), p. 175; Günther, 1860, *Cat. Fish.*, II, p. 102; Lowe, 1860, *Hist. Fish. Madeira*, p. 177; Steindachner, 1867, *SitzBer. Akad. Wiss. Wien*, LVI (1), p. 673; Collett, 1896, *Rés. Camp. Sci. Monaco*, X, p. 15; Collett, 1897, *Arch. Naturv. Christian.*, XIX, No. 7, p. 4; Kolombatović, 1904, *Hrvat. Naravosl. Društ. Glasnik*, XV, p. 186; Roule, 1907, *Arch. Zool. expér. gén.* (4) VI, *Notes et Revue*, p. xvi; Jaquet, 1907, *Bull. Inst. océan. Monaco*, CIX; Fage, 1918, *Rep. Danish Ocean. Exped.* 1908–10, II, A 3, p. 102.

Scorpaena rubellio, Jordan and Gunn, 1898, *Proc. Acad. Nat. Sci. Philad.*, p. 344.

Depth of body $2\frac{3}{4}$ to 3 in the length, length of head $2\frac{1}{2}$ to $2\frac{3}{4}$. Snout as long as or shorter than eye, diameter of which is $3\frac{2}{3}$ to $3\frac{3}{4}$ in length of head and $1\frac{1}{2}$ to $1\frac{3}{4}$ times interorbital width. Head with numerous small pores; cheeks and opercular region with visible scales. No occipital pit. 2 strong praeorbital spines, but only 2 or 3 spines on hinder part of suborbital ridge. A small supraorbital tentacle sometimes present;[1] a few small membranous processes on head. Length of band of palatine teeth a little more than $\frac{1}{2}$ diameter of eye. 10 to 12 gill-rakers on lower part of anterior arch. Scales spinulose and ciliated; 5 series between last soft-ray of dorsal and lateral line; breast scaled; no membranous processes on body. Dorsal XII 9 or 10; fourth to sixth spines longest, about twice in length of head. Anal III 5; second spine longer and stronger than third. Pectoral with 15 or 16 rays, extending to above vent or beyond; base broad, the lowermost ray inserted level with root of pelvic spine and in advance of uppermost. Brownish, with four irregular darker cross-bars, the first just behind the head, the last on the caudal peduncle; dorsal, anal and caudal fins spotted and blotched with dark brown, the caudal with a broad transverse bar of the same colour; pectoral spotted and barred with brown, and with some small white spots in the axil.

Hab. Mediterranean and adjacent parts of the Atlantic; Azores.

In the British Museum 17 specimens, 62–140 mm. in total length.

[1] This is particularly well developed in two examples from Cyprus, which in all other respects appear to be exactly similar to examples of similar size from other parts of the Mediterranean and from Madeira.

Scorpaena echinata, Koehler.

1896, *Ann. Univ. Lyon*, xxvi, p. 478, pl. xxvii, figs. 4–6.

Scorpaena cristulata, Holt and Byrne, 1908, *Fisheries Ireland Sci. Invest.*, 1906, v, p. 20, pl. ii.

Depth of body $2\frac{4}{5}$ to $3\frac{1}{5}$ in the length, length of head $2\frac{1}{6}$ to $2\frac{1}{3}$. Snout about as long as eye, diameter of which is $4\frac{1}{4}$ to $4\frac{2}{3}$ in length of head and twice or nearly twice width of interorbital space, which is very shallow. Top of head, cheeks and opercular region with visible scales. No occipital pit. Two blunt praeorbital spines; about 7 or 8 spines on suborbital ridge, which is prominent. No supraorbital tentacle, but some small filamentous processes scattered over the head. Length of band of palatine teeth about $\frac{2}{3}$ diameter of eye. 11 or 12 gill-rakers on lower part of anterior arch. Scales spinulose and ciliated; 6 or 7 series between last soft-ray of dorsal and lateral line; a few filamentous processes along lateral line; breast scaled. Dorsal XI–XII 9–10; fourth to sixth spines longest, $3\frac{1}{4}$ to $3\frac{1}{2}$ in length of head; soft dorsal largely covered with scales. Anal III 5; second spine longer and stronger than third. Pectoral with 21 or 22 rays, extending about to above vent; the lower rays much thickened; base broad. Pelvics not nearly reaching vent. Yellowish brown (reddish in life); uniform or with irregular patches of black on body; a black area covering greater part of spinous dorsal, and another on soft dorsal; anal sometimes with a large black blotch; pectoral with a large dusky area in the centre.

Hab. Deep water off the west and south-west of Ireland and in the Bay of Biscay.

In the British Museum 6 specimens, 330–510 mm. in total length.

It is possible that this species will prove to be identical with *S. cristulata*, Goode and Bean, from off the coast of Georgia, U.S.A., as suggested by Koehler himself, but I have hesitated to unite two species from different sides of the Atlantic without actual comparison of specimens. I have not been able to examine examples of the American species, and, judging from the published description and figure (which exhibit certain discrepancies), cannot find any definite characters to separate this from *S. echinata*, although it is possible that the scales will prove to be larger in the latter. Meanwhile, I think it better to regard the two species as distinct.

S. capensis, Gilchrist and von Bonde,[1] which Barnard[2] doubtfully places in the genus *Sebastosemus*, Gill, is clearly related to *Scorpaena echinata* and *S. cristulata*, but has thirteen dorsal spines. Further, the eye is larger, the interorbital space much narrower, the head less heavily armed, the maxillary broader, and the pectoral fin shorter. In spite of the difference in the number of dorsal spines, there can be little doubt that the two northern Atlantic species and that from the Cape are congeneric, and it seems probable that this character has considerably less value in the differentiation of genera than has generally been supposed.

[1] 1924, *Rep. Fish. Mar. Biol. Surv. S. Afric.*, iii (1922), Spec. Rep. No. VII, p. 18.

[2] 1927, *Ann. S. Afr. Mus.*, xxi, p. 909.

Genus Setarches, Johnson

1862, *Proc. Zool. Soc.*, p. 176. Type *Setarches guentheri*, Johnson.

Only one species of this genus occurs in the Atlantic, namely, *S. guentheri*, Johnson, from Madeira.

In the British Museum 3 specimens, 220–290 mm. in total length, including the type of the species.

PLATYCEPHALIDAE

Platycephalus gruveli, Pellegrin.

1905, *Bull. Soc. zool. Fr.*, XXX, p. 138, pl. iii, fig. 1; 1914, *Ann. Inst. océanogr. Paris*, VI (4), p. 81, figs. 14, 15.

St. 279. 10. viii. 27. Off Cape Lopez, French Congo. Large otter trawl, 58–67 m.: 2 specimens, 135–140 mm.

Hab. Tropical West Africa.

TRIGLIDAE

Lepidotrigla cadmani, Regan.

1915, *Ann. Mag. Nat. Hist.* (8) XV, p. 128.

St. 272. 30. vii. 27. Off Elephant Bay, Angola. Large otter trawl, 73–91 m.: 6 specimens, 125–240 mm.

St. 279. 10. viii. 27. Off Cape Lopez, French Congo. Large otter trawl, 58–67 m.: 16 specimens, 125–165 mm.

Hab. Off the coasts of Angola and French Congo.

This species was known previously only from the types, five specimens 130–170 mm. in total length, from Lagos.

BOTHIDAE[1]

Eucitharus linguatula (Linn.).

Norman, 1930, *Discovery Reports*, II, p. 359.

St. 272, St. 274, St. 279. Off Angola and French Congo. 9 specimens, 28–212 mm.

Arnoglossus imperialis (Rafin.).

Norman, 1930, *t.c.*, p. 360.

St. 272, St. 274, St. 279. Off Angola and French Congo. 3 specimens, 75–90 mm.

The following additional specimens have come to light since the publication of my previous report:

St. 274. 4. viii. 27. Off St Paul de Loanda, Angola. Net (4 mm. mesh) attached to back of trawl, 64–65 m.: 3 specimens, 29–30 mm.

Bothus podas (Delaroche).

Norman, 1930, *t.c.*, p. 362.

St. 271, St. 299. Angola and Cape Verde Islands. 4 specimens, 38–73 mm.

[1] Some of the Heterosomata have been dealt with in a previous report. For the sake of completeness, the species are listed again here.

SOLEIDAE

Solea (Dicologlossa) chirophthalmus, Regan.

Norman, 1930, *t.c.*, p. 363.

St. 274. Off Angola. 2 specimens, 145, 210 mm. 3 additional specimens, 245–255 mm., from the same locality.

CYNOGLOSSIDAE

Cynoglossus (Areliscus) lagoensis, Regan.

1915, *Ann. Mag. Nat. Hist.* (8) xv, p. 129.

St. 274. 4. viii. 27. Off St Paul de Loanda, Angola. Large otter trawl, 64–65 m.: 2 specimens, 455, 510 mm.

Hab. Coast of Angola.

Symphurus nigrescens, Rafin.

Norman, 1930, *t.c.*, p. 363.

St. 274, St. 279. Off Angola and French Congo.

The following additional specimen has come to light since the publication of my previous report:

St. 274. 4. viii. 27. Off St Paul de Loanda, Angola. Net (4 mm. mesh) attached to back of trawl, 64–65 m.: 1 specimen, 48 mm.

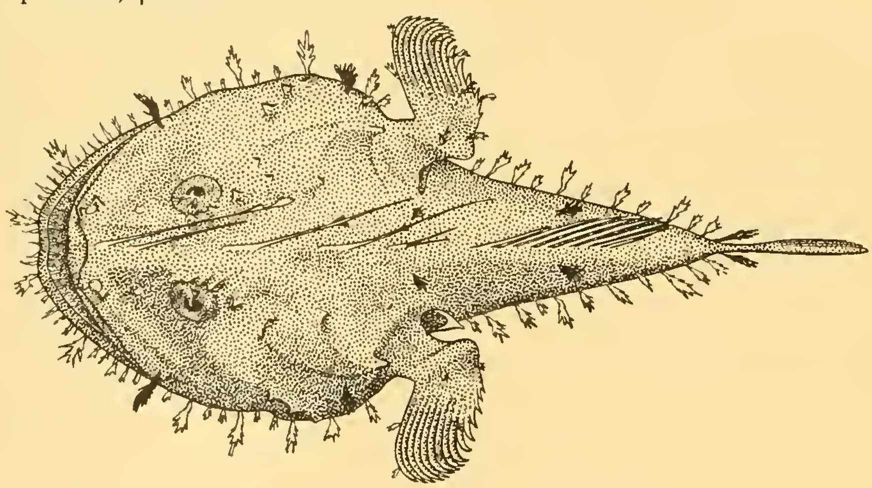

Fig. 12. *Chirolophius kempi.* Holotype. × $\frac{3}{4}$.

LOPHIIDAE

Chirolophius kempi, sp.n.

St. 279. 10. viii. 27. Off Cape Lopez, French Congo. Large otter trawl, 58–67 m.: 1 specimen (holotype), 140 mm.

Head nearly as broad as long, length (measured to lower angle of gill-opening) about $\frac{1}{2}$ that of fish. Snout nearly twice diameter of eye, which is about 7 in length of head and a little less than interorbital width. Praemaxillaries with two series of depressible teeth anteriorly and one series of small fixed teeth laterally; teeth in lower jaw in about three series; two teeth on each side of vomer. A pair of obtuse divergent

spines on each side of the snout; each supraorbital ridge bearing 2 or 3 very blunt spines; humeral spine simple, truncate or rounded posteriorly. First ray of spinous dorsal more than $\frac{1}{2}$ as long as head, reaching beyond base of third ray when laid back, with a complicated terminal flap; second ray broken off; third and fourth progressively shorter, with pairs of short lateral branches; fifth and sixth developed, connected by membrane basally. Soft dorsal with 8 rays, anal with 6, pectoral with 15 or 16. Greyish brown; lower surface of pectoral rays blackish.

This is the first species of the genus to be described from the Atlantic. Of the Indo-Pacific species it appears to approach most nearly to *C. moselyi*, Regan, from deep water north of New Guinea. I have much pleasure in naming this interesting fish after Dr Stanley Kemp, F.R.S., Director of Research of the Discovery Expedition.

SOUTH AFRICA

About 170 specimens were obtained in South African waters, representing 54 species. A few of these were collected at St. 90 (Basin of H.M. Dockyard, Simon's Town, False Bay), from the 10th to the 12th of July, 1926, but the majority were obtained during the voyage made by Mr E. R. Gunther and Mr F. C. Fraser on the 'Richard Bennet' from the 6th to the 10th of July, 1927. A number of stations (A–Q) were made during this trip, and, in order to avoid needless repetition, the details of these stations are given below, only the letter referring to the particular station appearing under the different species. All the fishes were taken with the commercial otter trawl. Nearly all the species represented are to be found in Dr K. H. Barnard's excellent monograph on the Marine Fishes of South Africa,[1] and a reference to this work is given in each case.

Trawling stations of the Cape Trawler 'Richard Bennet'

A. 6. vii. 27. 34° 00′ S, 17° 58′ E. 210–173 m.
B. 7. vii. 27. 34° 2′ S, 17° 41′ E. 311 m.
C. 7. vii. 27. 33° 58′ S, 17° 44′ E. 302 m.
D. 7. vii. 27. 33° 53′ S, 17° 38′ E. 310 m.
E. 7. vii. 27. 33° 57′ S, 17° 29′ E. 310–375 m.
F. 8. vii. 27. 34° 6′ S, 17° 42′ E. 311 m.
G. 8. vii. 27. 34° 2′ S, 17° 44′ E. 311–292 m.
H. 8. vii. 27. 34° 4′ S, 17° 36′ E. 292–402 m.
J. 8. vii. 27. 34° 8′ S, 17° 33′ E. 402–? 548 m.
K. 9. vii. 27. 33° 48′ 30″ S, 17° 35′ E. 274–301 m.
L. 9. vii. 27. 33° 44′ S, 17° 32′ E. 301–311 m.
M. 9. vii. 27. 33° 42′ S, 17° 29′ E. 311–402 m.
N. 9. vii. 27. 33° 48′ S, 17° 29′ 30″ E. 402–235 m.
O. 10. vii. 27. 33° 48′ S, 17° 30′ E. 329 m.
P. 10. vii. 27. 33° 42′ S, 17° 32′ E. 329 m.
Q. 10. vii. 27. 30° 47′ S, 17° 33′ E. 311 m.

[1] 1925–7, *Ann. S. Afr. Mus.*, XXI, 1065 pp., 37 pls., text-figs.

MYXINIDAE

Eptatretus hexatrema (Müller).

Barnard, 1925, *Ann. S. Afr. Mus.*, XXI, p. 16.

St. 90. 10–11. vii. 26. Large gauze fish-trap, 10 m.: 2 specimens, 460, 610 mm.

SCYLIORHINIDAE

Scyliorhinus (Scyliorhinus) capensis (Müll. and Henle).

Barnard, 1925, *Ann. S. Afr. Mus.*, XXI, p. 40.

St. B. 1 female specimen, 570 mm.

Scyliorhinus (Halaelurus) regani, Gilchrist.

Barnard, *t.c.*, p. 42.

St. A. 1 male specimen, 540 mm.

This species, which was not previously represented in the British Museum collection, appears to be most nearly related to *S. natalensis*, Regan, and *S. polystigma*, Regan.

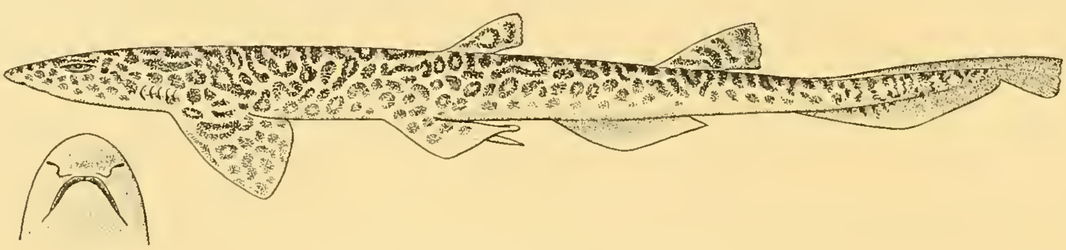

Fig. 13. *Scyliorhinus* (*Halaelurus*) *regani*. × ¼.

Scyliorhinus (Apristurus) saldanha, Barnard.

Barnard, *t.c.*, p. 44.

St. J. 1 male specimen, 430 mm., 2 females, 385, 415 mm.

These specimens agree fairly well with Barnard's description of *S. saldanha*. This species is apparently very close to *S. profundorum*, Goode and Bean, from the North Atlantic, and *S. indicus*, Brauer, from the Indian Ocean.

CARCHARINIDAE

Mustelus canis (Mitchill).

Barnard, 1925, *Ann. S. Afr. Mus.*, XXI, p. 30.

St. D. 1 young female specimen, 290 mm. (removed from a specimen, 1010 mm. long).

SQUALIDAE

Squalus acanthias, Linn.

Barnard, 1925, *Ann. S. Afr. Mus.*, XXI, p. 47.

St. D. 3 embryos with yolk-sacs, 175–195 mm.

Squalus acutipinnis, Regan.

Barnard, *t.c.*, p. 48.

St. A. 1 male specimen, 410 mm.; 1 female, 415 mm.
St. O. 1 male specimen, 665 mm.; 1 female, 575 mm.

Spinax spinax (Linn.).

Etmopterus spinax, Barnard, *t.c.*, p. 49.

St. J. 2 male specimens, 330, 335 mm.

Spinax granulosus, Günth.

Etmopterus granulosus, Barnard, *t.c.*, p. 49, pl. ii, fig. 8.

St. J. 2 male specimens, 345, 370 mm.

Spinax lucifer (Jordan and Snyder).

Etmopterus lucifer, Barnard, *t.c.*, p. 50.

St. J. 1 male specimen, 410 mm.

TORPEDINIDAE

Narcobatus nobilianus (Bonap.).

Barnard, 1925, *Ann. S. Afr. Mus.*, XXI, p. 89.

St. ?. 2 female specimens, 440, 500 mm.

RAJIDAE

Raja alba, Lacep.

Raia marginata, Barnard, 1925, *Ann. S. Afr. Mus.*, XXI, p. 65, pl. iv, fig. 1.

St. ?. 1 female specimen, 605 mm. (width of disc 465 mm.).

Raja smithi, Müll. and Henle.

Barnard, *t.c.*, p. 66, pl. iv, fig. 4.

St. N. 1 female specimen, 210 mm. (width of disc 150 mm.).

Raja barnardi, sp.n.

St. A. 1 immature male specimen, 375 mm. (width of disc 210 mm.).

See description below.

Raja caudaspinosa, Von Bonde and Swart.

St. J. 2 young female specimens, 200, 220 mm. (width of disc 100, 105 mm.).
St. N. 1 immature female specimen, 485 mm. (width of disc 270 mm.).

Raja leopardus, Von Bonde and Swart.

St. J. 1 young male specimen, 175 mm. (width of disc 95 mm.); 1 young female, 135 mm. (width of disc 75 mm.).

Revision of the South African Species of the Genus *Raja*

The difficulty of identifying the specimens of this genus obtained by the S.T. 'Richard Bennet' led me to suggest to Dr K. H. Barnard of the South African Museum that it might be of interest to revise our knowledge of the South African species of *Raja*. Several European rays have been recorded from the Cape, but in very few cases

has an actual comparison of specimens from the two regions been made. In addition, Dr C. von Bonde and Mr D. B. Swart have published a report upon the skates and rays collected by the S.S. 'Pickle', in which five new species of the genus *Raja* are described. Unfortunately, nearly all these species are based upon very small specimens, and no indication is given by the authors as to their relationships with previously known forms. The description of new species of this genus upon the basis of young individuals only is to be regretted, as these fishes change considerably with age, and until a complete series of stages becomes available it is quite impossible to refer such species to their correct place in the system.

Through the kindness of Dr von Bonde I have been able to examine type material of *R. parcomaculata*, *R. albalinea*, and *R. leopardus*, now preserved in the collection of the Government Marine Survey of South Africa: the types of *R. caudaspinosa* and *R. durbanensis*, said to be in the same collection, cannot unfortunately be found. Dr Barnard has been good enough to send to the British Museum as a loan all the specimens of *Raja* in the collection of the South African Museum, including three stuffed examples exhibited in the public galleries, as well as the type of *R. spinacidermis*. For this courtesy, and for the kindly interest that he has shown in this revision, I take this opportunity of offering my warmest thanks.

The arrangement of the species adopted here still remains more or less tentative, and further material of most species, including as far as possible examples of all stages of both sexes, will be required before it will be possible to arrive at any definite conclusions concerning the South African members of this difficult genus.

Key to the South African Species

I. Terminal parts of lateral line tubules on lower surface pigmented, appearing as small blackish spots and streaks; only one enlarged spine on back in adult; anterior margins of disc emarginate; vent nearer end of tail than tip of snout; length of snout about $4\frac{1}{3}$ in width of disc. *batis.*

II. No pigment spots or streaks on lower surface; vent about equidistant from tip of snout and end of tail or nearer the former; length of snout $4\frac{1}{2}$ to more than 6 in width of disc.

A. Disc never completely spinulose; eye + spiracle $1\frac{2}{3}$ to nearly 3 in length of snout.

1. Never more than one row of spines along middle of disc.

a. Snout abruptly narrowed into a long sharp point; upper surface of disc quite smooth; 40 to 46 rows of teeth ... ... *alba.*

b. Snout not abruptly narrowed; upper surface of disc more or less spinulose in parts.

α. Large buckler-like spines often present in mature females, mostly absent in males; 36 to 44 rows of teeth; tail with 1 (males) or 3 to 5 (females) rows of enlarged spines ... ... *rhizacanthus.*

β. No large buckler-like spines in either sex.

* Width of disc $\frac{2}{3}$ to $\frac{4}{5}$ of total length of fish; eye + spiracle 2 to $2\frac{4}{5}$ in length of snout, which is $5\frac{1}{4}$ to 6 in width of disc.

† 26 to 28 rows of teeth; tail with only one row of enlarged spines in both sexes; no ocelli on pectoral fins ... ... *smithi.*

†† 44 to 50 rows of teeth; tail with 3 to 5 rows of enlarged spines in both sexes; a rounded ocellus on each pectoral fin ... ... *ocellifera.*

** Width of disc scarcely $\frac{3}{5}$ of total length of fish; eye + spiracle $2\frac{2}{3}$ in length of snout, which is $4\frac{1}{2}$ in width of disc; 40 to 42 rows of teeth ... *barnardi.*

2. 3 or more rows of spines along middle of disc (except in young); usually a triangular patch of enlarged spines on the shoulder; width of disc about $\frac{3}{5}$ of total length of fish.

a. 32 to 42 rows of teeth; interorbital width less than longitudinal diameter of eye; eye + spiracle $1\frac{2}{3}$ in length of snout ... ... *caudaspinosa.*

b. 50 to 80 rows of teeth; interorbital width equal to or greater than longitudinal diameter of eye; eye + spiracle 2 to $2\frac{3}{4}$ in length of snout ... ... *leopardus.*

B. Upper surface of disc completely covered with close-set, fine, setiform spinules; no enlarged spines (except in young); eye + spiracle $3\frac{1}{2}$ in length of snout; 60 rows of teeth (in adult) *spinacidermis.*

Raja batis, Linnaeus.

1758, *Syst. Nat.*, ed. 10, p. 231; Barnard, 1925, *Ann. S. Afr. Mus.*, xxi, p. 70, pl. iv, fig. 3; Clark, 1926, *Fisheries, Scotland, Sci. Invest.*, 1926, 1, p. 50, pls. xxxi, fig. *b*, xxxii, xxxiii, figs. *a* and *b*.

Raia stabuliforis, von Bonde and Swart, 1923, *Rep. Fish. Mar. Biol. Surv. S. Afric.*, III (1922), Spec. Rep. v, p. 12.

Disc broader than long, its width about $\frac{2}{3}$ of the total length; anterior margins more or less undulated and deeply emarginate; outer angles nearly rectangular. Vent rather nearer to end of tail than to tip of snout. Snout acutely pointed, its length about $4\frac{1}{3}$ in width of disc. Interorbital width less than diameter of eye + spiracle, which is about $2\frac{3}{4}$ in length of snout. Internasal width about $2\frac{1}{2}$ in praeoral length of snout. Teeth more or less flat; about 52 rows. Upper surface mainly smooth, but with some small scattered spinules, chiefly on snout, anterior margins of pectorals and middle of back; 2 or 3 praeocular and 1 or 2 postocular spines; a single large nuchal spine; tail with a median series of about 21 strong spines, alternately larger and smaller, and with an irregular series of 4 or 5 spines on each side; 3 spines between the dorsal fins. Lower surface rough on snout, but otherwise smooth. Upper surface brownish, with a few irregularly arranged darker spots; lower surface greyish; terminal parts of lateral line tubules pigmented, appearing as small blackish spots and streaks.

Hab. Coasts of Europe, from Iceland and Scandinavia to Madeira; Mediterranean (?); South Africa.

Described from a single mounted female specimen, 680 mm. in total length (480 mm. across disc), from off Cape Point, 100 fathoms.

It is possible that the South African form described here will eventually prove to be distinct from the European *R. batis*, but, as I have only seen a single stuffed example, I have hesitated to separate the two at present. Comparison with a European example of similar size suggests that the South African form may have a narrower interorbital region and perhaps a larger eye, but since artificial eyes have been inserted in the specimen accurate measurements are impossible. The arrangement of the spines on the tail appears to be different, the disc is rather more spinulose, and the enlarged nuchal spine has no counterpart in *R. batis* from Europe.

Raja alba, Lacepède.

1803, *Hist. Nat. Poiss.*, v, p. 661, pl. xx, fig. 1; von Bonde and Swart, 1923, *t.c.*, p. 5.

Raja marginata, Lacepède, 1803, *t.c.*, p. 662, pl. xx, fig. 2; Regan, 1908, *Ann. Natal Mus.*, I, p. 242; Barnard, 1925, *t.c.*, p. 65, pl. iv, fig. 1; Clark, 1926, *t.c.*, p. 47, pls. xxviii, xxix, xxx figs. *a* and *b*, xxxi fig. *a*.

Disc broader than long, its width about $\frac{4}{5}$ of the total length; anterior margins undulated; outer angles pointed. Vent about equidistant from tip of snout and end of tail. Snout abruptly narrowed into a long sharp point, its length $4\frac{2}{3}$ to $5\frac{3}{4}$ in width of disc. Interorbital width about equal to diameter of eye + spiracle, which is 2 (young) to nearly 3 in length of snout. Internasal width $1\frac{2}{5}$ (young) to 2 in praeoral length of snout. Teeth with long conical points in the middle of the jaws, more obtuse and with short points laterally; 40 to 46 rows. Upper surface quite smooth; one praeocular and generally one postocular spine; no nuchal or scapular spines, and no median spines on disc; tail with a median series of 11 to 18 spines, extending forward to posterior end of base of pelvic, and with a lateral series on each side. Lower surface with small spines on the snout and along the anterior edges of the pectorals. Upper surface uniformly brownish or more or less spotted with white; lower surface white, the tail and margins of pectorals and pelvics often brownish or blackish, especially in the young.

Hab. Coasts of Europe, from the English Channel to the Mediterranean; coasts of northern and north-western Africa; South Africa.

Described from 12 specimens, 270–605 mm. in total length (205–465 mm. across disc), from Kalk Bay, Simonstown, Agulhas Bank, Cape St Blaize, and off Bird Island, Natal.

Comparison of South African with European material shows that as a general rule the snout is a little longer in examples from Europe, but this character appears to be subject to considerable variation and I am unable to detect any other differences of importance. Clark has shown that Lacepède's young black-bordered *R. marginata* is identical with the white-bellied adult, *R. alba*, described by the same author. In accordance with Article 28 of the International Rules, the name *alba* (p. 661) takes precedence of *marginata* (p. 662).

Raja rhizacanthus, Regan.

Raja capensis (*non* Gmelin), Müller and Henle, 1841, *Plagiost.*, p. 151; Duméril, 1865, *Hist. Nat. Poiss.*, I, p. 540, pl. xii, figs. 11 and 12; Sauvage, 1891, *Hist. Nat. Poiss. Madagascar*, p. 1; von Bonde and Swart, 1923, *t.c.*, p. 4.

? *Raja capensis*, Kner, 1869, *Reise 'Novara'*, *Zool.* I, 5. Fische, p. 419.

Raia rhizacanthus, Regan, 1906, *Ann. Natal Mus.*, I, p. 3, pl. iii.

Raia clavata, Barnard, 1925, *t.c.*, p. 64, pl. iv, fig. 2.

Disc broader than long, its width $\frac{4}{5}$ to $\frac{5}{6}$ of the total length; anterior margins more or less undulated; outer angles pointed. Vent equidistant from tip of snout and end of tail or a little nearer to the former. Snout with a short, obtuse, triangular projection, its length $5\frac{1}{4}$ to more than 6 in width of disc. Interorbital width equal to or rather greater than (a little less than in young) diameter of eye + spiracle, which is $2\frac{1}{3}$ to

about $2\frac{3}{5}$ in length of snout. Internasal width $1\frac{1}{2}$ to $1\frac{2}{3}$ in praeoral length of snout. Teeth pointed in males, at least in middle of jaws, blunt in females; 36 to 44 rows (fewer in young). Upper surface of disc and tail in young with small scattered spines, chiefly confined to the snout, interorbital region, anterior parts of pectorals and the sides of the tail; in adults the disc and tail are more or less covered with small spinules; mature females sometimes with large round "bucklers" bearing claw-like spines scattered irregularly over the upper and lower surfaces, which are nearly always absent in males; 2 praeocular and 3 postocular spines in the young, the numbers being reduced or the spines disappearing altogether in the adults; young with a pair of scapular spines, disappearing in the adults; a median series of 27 to 45 spines, extending anteriorly to beyond the scapulary region in the young, but scarcely beyond the pelvic region in adults; tail in females with one or two lateral series of spines. Lower surface smooth in the young, but adults with some small spines, especially on the snout. Brownish or greyish, with or without darker and paler markings; young generally with a dark ocellated spot, sometimes circular, sometimes oblong, near the middle of the base of each pectoral; lower surface pale, occasionally with some dark patches.

Hab. South Africa, from Walfish Bay to the coast of Natal; Madagascar.

Described from 13 specimens, 135–840 mm. in total length (90–620 mm. across disc), from Kalk Bay, False Bay, Agulhas Bank, off Cape St Blaize, and off Bird Island, Natal.

This species is closely related to *R. clavata*, the thornback ray of European seas, but the two appear to be distinct. In *R. clavata* the upper surface is entirely spinulose, even in the newly hatched young, whereas in the African species the adults are never completely covered with spinules. Comparison of specimens of equal size shows that in *R. clavata* the spinules are always more closely set. Further, in *R. clavata* the tail is constantly rather longer, the vent being distinctly nearer to the tip of the snout than to the end of the tail, and there is a difference in the shape of the snout.

The four large specimens from near Cape St Blaize and west of Cape Point, sent to the British Museum in 1900 by Dr Gilchrist, and identified by Dr G. A. Boulenger as *R. batis*, prove to belong to this species.

Raja smithi, Müller and Henle.

1841, *Plagiost.*, p. 150, pl. xlix, fig. 1; Barnard, 1925, *t.c.*, p. 66, pl. iv, fig. 4.

Disc broader than long, its width $\frac{2}{3}$ to $\frac{3}{4}$ of the total length; anterior margins a little undulated; outer angles obtusely pointed. Vent nearly equidistant from tip of snout and end of tail. Snout a little produced, its length $5\frac{2}{5}$ to $5\frac{2}{3}$ in width of disc. Interorbital width equal to or a little less than diameter of eye + spiracle, which is 2 to about $2\frac{3}{5}$ in length of snout. Internasal width $1\frac{1}{2}$ to $1\frac{2}{3}$ in praeoral length of snout. Teeth rather widely spaced, those in the middle of the jaws pointed in both sexes; 26 to 28 rows. Upper surface with small four- or five-rooted spinules on snout, interorbital region, anterior, posterior and outer parts of pectorals, and on the middle of the back, the last being more numerous in adults; no enlarged ocular spines; young with 14 to 16 median spines on the tail, and adults with 4 or 5 additional median spines on the

back behind the nuchal region; sides of tail with several series of very small spinules. Lower surface quite smooth. Upper surface more or less uniformly brownish or greyish; lower surface white, sometimes with irregular black blotches and with black margins to the posterior part of the disc; lower surface of tail black.

Hab. South Africa.

Described from 3 specimens, 210–520 mm. in total length (150–330 mm. across disc), including the type of the species (a dried skin).

Barnard regards *R. eatoni*, Günther, from Kerguelen Island, as a local variety of *R. smithi*, but, although the two species are clearly related, they seem to be distinct. *R. eatoni* has a longer and more pointed snout and there are obvious differences in the spination.

Raja ocellifera, Regan.

1906, *Ann. Natal Mus.*, 1, p. 2, pl. ii; 1908, *t.c.*, p. 242; Barnard, 1925, *t.c.*, p. 67.

Disc broader than long, its width $\frac{2}{3}$ to $\frac{4}{5}$ of the total length; anterior margins more or less undulated; outer angles rounded or obtusely pointed. Vent a little nearer to tip of snout than to end of tail. Snout with a short, obtuse, triangular projection, its length $5\frac{1}{4}$ (young) to 6 in width of disc. Interorbital width greater than diameter of eye, but less than that of eye + spiracle, which is 2 (young) to $2\frac{2}{5}$ in length of snout. Internasal width $1\frac{1}{3}$ to $1\frac{2}{3}$ in praeoral length of snout. Teeth with sharp points in males (but often much worn), more or less obtuse in females; 44 to 50 rows. Upper surface of disc and tail smooth, except for a few small spinules on tip of snout, on rostral ridges, and on anterior margins of pectorals, these spinules stronger in males; 2 to 4 praeocular and 2 or 3 postocular spines; usually 1 to 3 median nuchal spines; young with a pair of scapular spines; a median series of spines commencing on posterior part of body and extending on to tail, commencing further forward in females than in males; in young of both sexes the series commences immediately behind the suprascapular region; tail with one or two series of spines on each side. Lower surface quite smooth. Upper surface brownish, with or without small darker spots; a large bluish-black, white-edged ocellus near the middle of the base of each pectoral; lower surface uniformly pale.

Hab. South Africa, from False Bay to Natal.

Described from 12 specimens, 125–490 mm. in total length (88–340 mm. across disc), from False Bay, Agulhas Bank, off Cape St Blaize, Algoa Bay, and the coast of Natal, including the types of the species.

This species is closely related to *R. miraletus* from the Mediterranean and the west coast of Africa, which has, however, a somewhat longer tail, a longer snout ($4\frac{1}{2}$ to $5\frac{1}{4}$ in width of disc and $2\frac{1}{3}$ to $2\frac{2}{3}$ times eye + spiracle), narrower interorbital region (equal to or less than, only occasionally greater than, diameter of eye), and there are only 38 to 42 rows of teeth. In *R. miraletus* the ocellus is nearly circular, whereas, in *R. ocellifera* this tends to be horizontally ovate. In some respects the two specimens obtained by the 'Discovery' off the coast of Angola approach the African form, but should, I think, be referred to *R. miraletus*.

The specimens from near Cape St Blaize, sent to the British Museum in 1900 by Dr Gilchrist, and identified by Dr Boulenger as *R. miraletus*, prove to belong to *R. ocellifera*.

Raja barnardi, sp.n.

Disc a little broader than long, its width scarcely $\frac{3}{5}$ of the total length; anterior margins a little undulated; outer angles smoothly rounded. Vent a little nearer to tip of snout than to end of tail. Snout with a rather short, obtuse, triangular projection, its length $4\frac{1}{2}$ in width of disc. Interorbital width about equal to diameter of eye; eye + spiracle $2\frac{2}{3}$ in length of snout. Internasal width $2\frac{1}{3}$ in praeoral length of snout. Teeth more or less pointed in middle of jaws; 40 to 42 rows. Upper surface of disc and tail mainly smooth, but a large patch of spinules on anterior part of each pectoral, and some scattered spinules on snout, interorbital region, middle of back and hinder parts of pectorals; 2 praeocular and 4 postocular spines; 3 median nuchal spines, with a smaller one on each side; a single median spine above the suprascapulary region; 2 scapular spines; a series of 24 median spines extending from just behind the suprascapulary region to the first dorsal; anterior part of tail with a somewhat irregular series of spines on each side; edges of tail with numerous small spinules. Lower surface quite smooth except at edges of snout. Upper surface brownish, with traces of small pale spots; lower surface uniformly pale.

Hab. Off Cape Town.

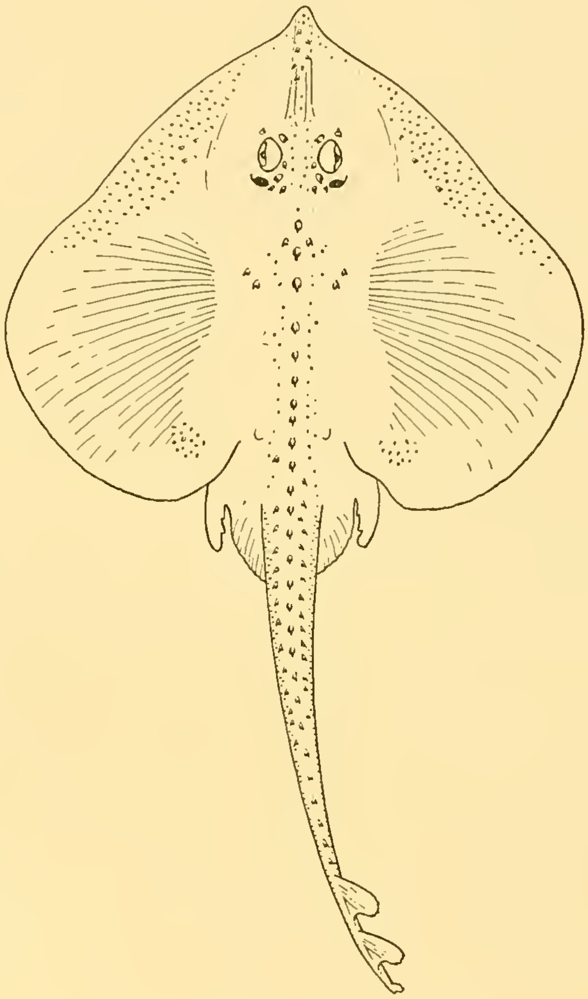

Fig. 14. *Raja barnardi.* Holotype. $\times \frac{1}{3}$.

Described from a single male specimen, 375 mm. in total length (210 mm. across disc), from 34° S, 17° 58′ E, at a depth of 210–173 m.; obtained by the Discovery Expedition.

Raja caudaspinosa, von Bonde and Swart.

? *Raia albalinea*, von Bonde and Swart, 1923, *t.c.*, p. 6, pl. xx, fig. 1.

Raia caudaspinosa, von Bonde and Swart, 1923, *t.c.*, p. 8, pl. xxi, fig. 1; Barnard, 1925, *t.c.*, p. 66.

Disc rather broader than long, its width about $\frac{3}{5}$ of the total length; anterior margins a little undulated; outer angles obtusely pointed. Vent much nearer to tip of snout

than to end of tail. Snout with a very small and obtuse projection, its length 6 in width of disc. Interorbital width less than diameter of eye; eye + spiracle $1\frac{2}{3}$ in length of snout. Internasal width $2\frac{1}{4}$ in praeoral length of snout. Teeth mostly flat, but some in middle of jaws more or less bluntly pointed; (32 to 36) 40 to 42 rows. Upper surface of disc mainly smooth, but a large patch of stellate-based spinules on anterior part of each pectoral; a group of spines on the snout; a series of 9 spines above each orbit and spiracle, and a pair between the spiracles; 2 median nuchal spines and a pair of scapular spines; a series of median spines extending from just behind the suprascapulary region to the first dorsal, and a lateral series of smaller spines on each side; on the tail there is an additional series at each edge, making 5 rows in this region. Lower surface quite smooth. Upper surface more or less uniformly brownish grey.

Hab. South Africa, from off Cape Town to the coast of Natal.

Described from a single female specimen, 485 mm. in total length (270 mm. across disc), from 33° 48′ S, 17° 29′ E, at a depth of 402–235 m.; obtained by the Discovery Expedition. The unique holotype was a female, 346 mm. in total length (172 mm. across disc).

It seems probable that *R. albalinea* represents the young of the species described above, but in the absence of examples of intermediate size it is impossible to confirm this. The following description of the young stages is based upon the very small type of *R. albalinea* (110 mm.) and two somewhat larger examples (200, 220 mm.) obtained by the Discovery Expedition: Disc subcircular, its width about $\frac{1}{2}$ the total length; anterior margins very little undulated. Length of snout about 6 in width of disc. Interorbital width equal to or rather less than diameter of eye; eye + spiracle $1\frac{1}{4}$ to about $1\frac{1}{2}$ in length of snout, 30 to 34 rows of teeth. Upper surface of disc more or less covered with scattered spinules in the smallest example, but in the larger these tend to be more strongly developed on the anterior parts of the pectorals; 2 praeocular and 2 or 3 postocular spines; 2 or 3 median nuchal spines and 2 or 3 scapular spines; a median series of 22 to 27 strong spines extending from just behind the suprascapulary region to the first dorsal; in the type this series is continuous with the nuchal spines; in one of the larger specimens there are 2 or 3 spines on each side of the median row on the disc; tail with several series of spinules laterally, those at edge larger. Lower surface quite smooth. Upper surface pale brownish grey, with some rather indistinct and nearly horizontal white lines near the edges of the pectoral fins.

Described from 3 specimens, 110–220 mm. in total length (55–105 mm. across disc).

Raja leopardus, von Bonde and Swart.

Raia quadrimaculata (*non* Risso), von Bonde and Swart, 1923, *t.c.*, p. 5; Barnard, 1925, *t.c.*, p. 70, pl. iv, fig. 5.

Raia leopardus, von Bonde and Swart, 1923, *t.c.*, p. 7, pl. xx, fig. 2; Barnard, 1925, *t.c.*, p. 74.

Raia lintea, Barnard, 1925, *t.c.*, p. 72.

Raia naevus, Barnard, 1925, *t.c.*, p. 72.

Disc broader than long, its width about $\frac{3}{5}$ of the total length; anterior margins more or less undulated, except in young, deeply notched in adult males; outer angles broadly

rounded. Vent a little nearer to tip of snout than to end of tail. Snout with a rather short, obtuse, triangular projection, its length $4\frac{1}{2}$ to more than 6 in width of disc. Interorbital width equal to (young) or greater than diameter of eye, but always less than that of eye + spiracle, which is 2 to $2\frac{3}{4}$ in length of snout. Internasal width $1\frac{2}{3}$ to $2\frac{1}{3}$ in praeoral length of snout. Teeth pointed in mature individuals of both sexes, but often worn quite flat; 50 to 80 rows. Upper surface of disc and tail mainly smooth, but with some scattered small, often stellate-based spinules, chiefly on snout, anterior parts of pectorals and sides of tail; larger spines all with stellate bases; a series of spines above each orbit and spiracle, and a pair between the spiracles; young with 2 to 4 median nuchal spines, and 2 or 3 scapular spines; in adults there is a triangular patch of spines on the nucho-scapulary region; young with a series of 25 to 27 median spines extending from just behind the suprascapulary region to the first dorsal; these are gradually reduced during growth, being represented by rather obtuse spines in a mature male, and are absent altogether in large females; 1 or 2 lateral series on each side of the median line of the back (except in young), persisting in the largest specimens in which the median series has disappeared, and 2 series, with some irregularly arranged additional spines, on each side of the tail. Lower surface rough on snout and (in adults) the anterior edges of the pectorals; otherwise smooth. Upper surface brownish or greyish, sometimes with numerous round dark spots, chiefly obvious in the young; sometimes traces of pale, dark-edged ocelli, and occasionally a very faint *naevus*-like ocellus near the middle of the base of each pectoral; lower surface uniformly pale or with some irregularly shaped but more or less symmetrically arranged greyish or blackish patches on pectorals and pelvics.

Hab. South-western Africa, off Cape Peninsula and Saldanha Bay; coast of Natal.

Described from 14 specimens, 110–975 mm. in total length (58–625 mm. across disc), from off Dassen Island, Table Bay and Cape Point, and from the coast of Natal, including the types of the species.

I have little doubt, after examining all the available material, that the forms described by Barnard as *quadrimaculata* and *naevus* represent the same species, the description of the former being based upon very large female specimens. The types of *R. leopardus* are both very small (110, 180 mm. in total length; 58, 95 mm. across disc), but are almost certainly the young of the species described above. The mounted specimen, 740 mm. in total length (485 mm. across disc), identified by Barnard as *R. lintea*, appears to belong to this species.

This species has been confused with *R. naevus* of European seas, but the two are quite distinct. In *naevus* the snout is rather shorter and blunter, its length 5 (young) to about $6\frac{1}{2}$ in width of disc; the interorbital width is equal to or rather less than diameter of eye; and there are only 54 to 60 rows of teeth. Further, comparison of specimens of similar size shows the spination to be different, the small spinules being much more numerous and better developed in the European species. Also, *R. leopardus* lacks the large ocellus which is so characteristic of *R. naevus*.

Raja spinacidermis, Barnard.

Raia spinacidermis, Barnard, 1923, *Ann. S. Afr. Mus.*, XIII, p. 440; Barnard, 1925, *t.c.*, p. 73, pl. iv, fig. 6.

? *Raia durbanensis*, von Bonde and Swart, 1923, *t.c.*, p. 11, pl. xxii, fig. 1; Barnard, 1925, *t.c.*, p. 69.

? *Raia plutonia*, Barnard, 1925, *t.c.*, p. 68.

Disc broader than long, its width about $\frac{5}{6}$ of the total length; anterior margins scarcely undulated; outer angles broadly rounded. Vent very little nearer to tip of snout than to end of tail. Snout pointed but not produced, its length $4\frac{3}{4}$ in width of disc. Interorbital width a little greater than diameter of eye + spiracle, which is $3\frac{1}{2}$ in length of snout. Internasal width 2 in praeoral length of snout. Teeth in middle of jaws slightly pointed; 60 rows. Upper surface of disc and tail wholly covered with closely-set, fine, setiform spinules, which are larger and closer together on the tail than elsewhere; no enlarged spines. Lower surface of disc smooth; tail, except the median line of the basal part, spinulated like the upper surface. Upper surface pale slaty grey, becoming a little darker towards the hinder margins of the pectorals and distinctly darker on pelvics; lower surface similarly and as deeply coloured as upper surface.

Hab. South Africa.

Described from the single type specimen, a female, 600 mm. in total length (510 mm. across disc), believed to be from off Cape Point in deep water.

This species appears to be most nearly related to the European shagreen ray, *R. fullonica*, Linnaeus.

It seems probable that the two very young specimens, 120 and 190 mm. in total length (68 and 100 mm. across disc), from south of the Agulhas Bank and from off Cape Point, identified by Barnard as *R. plutonia*, belong here. In the smaller of these there is a median series of spines on the disc and tail, but these are already disappearing in the larger specimen: there are also some spines above the orbits and spiracles, and one or two pairs of scapular spines.

DOUBTFUL SPECIES

Raja montagui, Fowler (= *R. maculata*, Montagu *nec* Shaw).

Raia maculata, Barnard, 1925, *t.c.*, p. 71.

This species has been recorded by Bleeker (1860) and Pappe (1866), but it is probable that the true *montagui* does not occur in South Africa and that their specimens should be referred to some other species.

Raja parcomaculata, von Bonde and Swart.

1923, *t.c.*, p. 9, pl. xxi, fig. 2.

The type specimen from Natal examined by me is only 181 mm. in total length (60 mm. across disc).

CHIMAERIDAE

Chimaera africana, Gilchrist.

Barnard, 1925, *Ann. S. Afr. Mus.*, XXI, p. 95.

St. ?. 1 female specimen, 625 mm.

This species is well distinguished from *C. monstrosa*, Linn., by the absence of a distinct anal fin, as well as by the shorter pectoral fins, black coloration, etc. The lateral line in the present specimen is distinctly sinuous, and not straight as described by Barnard. Further, with regard to the cephalic branches of the lateral line, on one side of the head the opercular and malar branches arise together from the suborbital, whereas, on the other side they are united to form a common branch for a very short distance. It is not unlikely that *C. africana* will eventually prove to be identical with *C. affinis*, Capello (= *C. plumbea*, Gill, and *C. abbreviata*, Gill), which has been described from large specimens taken on both sides of the Atlantic. The caudal filament perhaps becomes shorter with age.

ARIIDAE

Galeichthys feliceps, Cuv. and Val.

Boulenger, 1911, *Cat. Fresh-water Fish. Africa*, II, p. 381, fig. 295.

29. vii. 27. Simon's Town. 1 specimen, 150 mm.

Found while draining the dry dock.

CONGRIDAE

Congermuraena albescens, Barnard.

Barnard, 1925, *Ann. S. Afr. Mus.*, XXI, p. 189, pl. ix, fig. 1.

St. E. 1 specimen, 725 mm.

SCOMBRESOCIDAE

Scombresox saurus (Walbaum).

Barnard, 1925, *Ann. S. Afr. Mus.*, XXI, p. 259, fig. 16.

St. K. 1 specimen, 355 mm. (from the stomach of *Merluccius capensis*).

MACRORHAMPHOSIDAE

Notopogon macrosolen, Barnard.

Barnard, 1925, *Ann. S. Afr. Mus.*, XXI, p. 279, pl. xi, fig. 3.

St. G. 1 specimen, 220 mm.

St. M. 1 specimen, 250 mm.

St. O. 1 specimen, 263 mm.

MACRURIDAE

Coryphaenoides (Paramacrurus) fasciatus (Günther).

Barnard, 1925, *Ann. S. Afr. Mus.*, XXI, p. 340.

St. A. 6 specimens, 260–345 mm.

St. B. and H. 4 specimens, 130–240 mm.

St. J. 9 specimens, 390–650 mm.

Coryphaenoides (Oxygadus) braueri, Barnard.

Barnard, *t.c.*, p. 342, pl. xiii, fig. 5.

St. J. 12 specimens, 220–405 mm. (the largest example has the tail broken).

Malacocephalus laevis (Lowe).

Barnard, *t.c.*, p. 344.

St. B. 4 specimens, 510–660 mm. (three of the examples have the tail damaged).

Lionurus leonis, Barnard.

Barnard, *t.c.*, p. 349, pl. xiii, fig. 6.

St. O. 1 specimen, 360 mm.

Lionurus sp.

St. J. 1 specimen, 245 mm.

MERLUCCIIDAE

Merluccius capensis, Casteln.

Barnard, 1925, *Ann. S. Afr. Mus.*, XXI, p. 320, pl. xii, fig. 5.

St. B. 1 specimen, 173 mm.

St. C. 3 specimens, 405–530 mm.

St. P. 5 specimens, 640–850 mm.

Barnard notes that "there still seems room for doubt as to whether the Cape Hake is really distinct from the northern Atlantic *M. vulgaris*". I have carefully compared examples of both species, and find that, in addition to the somewhat larger scales, the Cape form may be readily distinguished by the larger eye, greater number of gill-rakers (13 or 14 instead of 7 or 8), and longer pectoral fin.

GADIDAE

Lepidion capensis, Gilchrist.

Barnard, 1925, *Ann. S. Afr. Mus.*, XXI, p. 324, pl. xiii, fig. 1.

St. J. 6 specimens, 310–500 mm.

Lepidion natalensis, Gilchrist.

Barnard, *t.c.*, p. 324.

St. J. 1 specimen, 408 mm.

A Synopsis of the Species of *Lepidion*

In order to satisfy myself as to the systematic position and nomenclature of the two species found at the Cape, I have been led to examine all the specimens of this genus in the British Museum collection, and have prepared a brief synopsis of the group.

Genus **Lepidion**[1]

Lepidion, Swainson, 1838, *N.H. Fishes etc.*, I, p. 318. Type *Gadus lepidion*, Risso.
Haloporphyrus, Günther, 1862, *Cat. Fish.*, IV, p. 358. Type *Gadus lepidion*, Risso.

[1] According to the International Rules, this is not invalidated by *Lepidia*, Savigny—a genus of worms.

Key to the Species[1]

I. Snout $1\frac{1}{2}$ to $1\frac{2}{3}$ times eye, which is $4\frac{3}{4}$ to $5\frac{1}{2}$ in head; barbel longer than eye.

A. Depth 4 to $4\frac{1}{4}$ in length; pectoral about $1\frac{5}{6}$ in head.

1. Dorsal 4+52–56; 15 or 16 scales between first dorsal fin and lateral line ... *guentheri.*

2. Dorsal 4+60; about 18 scales between first dorsal fin and lateral line ... *oidema.*

B. Depth more than 5 in length; pectoral about $1\frac{1}{2}$ in head; dorsal and anal with deep black margins, the black area covering greater part of fin posteriorly ... ... *natalensis.*

II. Snout as long as or shorter than eye, which is $2\frac{3}{4}$ to $3\frac{3}{4}$ in head; barbel generally shorter than eye.

A. Filamentous dorsal ray much longer than head; dorsal 4 or 5+52–62; 155 or more scales in lateral line.

1. About 155 to 180 scales in lateral line, about 13 to 16 between first dorsal fin and lateral line; caudal peduncle $3\frac{1}{4}$ to 4 times as long as deep.

a. Dorsal 4 (5)+52, anal 46–48; scales 155–160/13 or 14 ... ... *lepidion.*

b. Dorsal 4+56–62; anal 49–54; scales 180/15 or 16 ... ... *eques.*

2. About 220 to 250 scales in lateral line, about 18 to 20 between first dorsal fin and lateral line; caudal peduncle $1\frac{1}{3}$ to nearly 3 times as long as deep.

a. Last ray of second dorsal nearly above that of anal; eye $3\frac{3}{4}$, pectoral $1\frac{5}{6}$ in head; dorsal 5+60, anal 52 ... ... *inosimae.*

b. Last ray of second dorsal posterior to that of anal; eye $2\frac{3}{4}$ to $3\frac{1}{2}$, pectoral $1\frac{2}{5}$ to $1\frac{2}{3}$ in head; dorsal 5+52–56, anal 46–50.

α. Caudal peduncle $1\frac{1}{3}$ to twice as long as deep; filamentous dorsal ray not broad and compressed ... ... *capensis.*

β. Caudal peduncle $2\frac{2}{3}$ to nearly 3 times as long as deep; filamentous dorsal ray broad and compressed ... ... *ensiferus.*

B. Filamentous dorsal ray much shorter than head; about 140 scales in lateral line; dorsal 5+50; caudal peduncle about $2\frac{1}{2}$ times as long as deep ... ... *modestus.*

Lepidion guentheri (Giglioli).

Haloporphyrus lepidion (*non* Risso), Johnson, 1862, *Ann. Mag. Nat. Hist.* (3) x, p. 166; Günther, 1862, *Cat. Fish.*, iv, p. 358.

Haloporphyrus guentheri, Giglioli, 1880, *Nature*, xxi, p. 202; Vinciguerra, 1883, *Ann. Mus. Civ. stor. nat. Genova*, xviii, p. 558; Günther, 1887, *Deep-Sea Fish. 'Challenger'*, p. 90, pl. xviii, fig. A; Carus, 1889–93, *Prodr. Faun. Medit.*, ii, p. 576.

Lepidion guentheri, Goode and Bean, 1895, *Ocean. Ichth.*, p. 370.

Hab. Mediterranean and adjacent parts of the Atlantic.

In the British Museum 2 specimens, 500 and 610 mm. in total length.

Lepidion oidema (Tanaka).

Haloporphyrus oidema, Tanaka, 1927, *Fig. Descr. Fish. Japan*, xli, p. 796, pl. clxxi, fig. 472.

Hab. Deep water off Misaki, Sagami Prov., Japan.

The type was 345 mm. long. This species may prove to be identical with the preceding one.

[1] *Microlepidium*, Garman, is distinguished by the longer lower jaw, higher number of rays in the first dorsal fin, absence of filamentous dorsal ray, much larger number of pyloric appendages, etc. There are two species: *M. verecundum* (Gilbert) and *M. grandiceps*, Garman.

Lepidion natalensis, Gilchrist.

Lepidion natalensis, Gilchrist, 1922, *Rep. Fish. Mar. Biol. Surv. S. Afric.*, II (1921), Spec. Rep. III, p. 62; Barnard, 1925, *Ann. S. Afr. Mus.*, XXI, p. 324.

Depth of body about $5\frac{1}{3}$ in the length, length of head nearly 4. Snout $1\frac{1}{2}$ times as long as eye, diameter of which is 5 in length of head and about equal to interorbital width. Maxillary extending to a little beyond middle of eye; barbel very slightly longer than eye. 9 gill-rakers on lower part of anterior arch. Dorsal 5 + 58;[1] filamentous ray $1\frac{2}{3}$ times as long as head. Anal 55. Pectoral about $1\frac{1}{2}$ in length of head. Pelvic 7-rayed; not reaching vent, longest ray $\frac{5}{6}$ length of head. About 20 pyloric caeca.

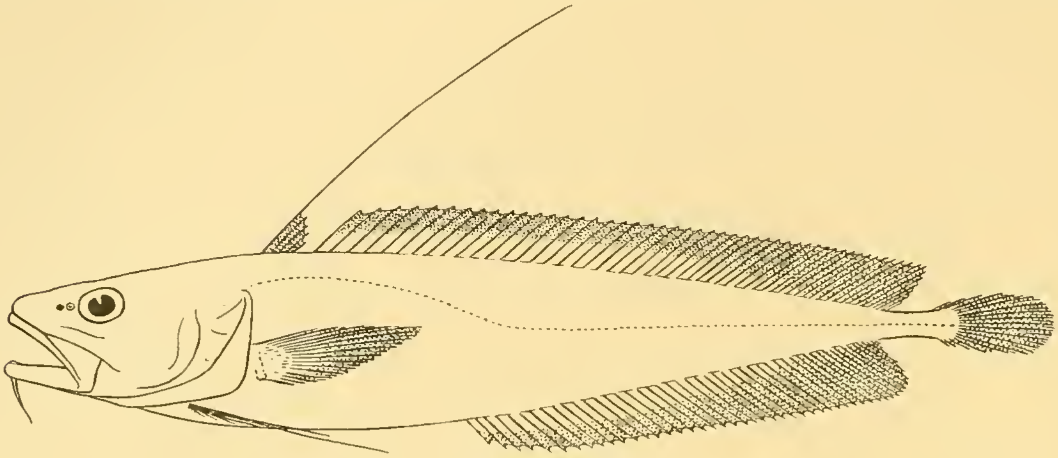

Fig. 15. *Lepidion natalensis.* $\times \frac{1}{3}$.

Pinkish grey; dorsal and anal fins with deep black margins, the black area becoming broader behind and covering the greater part of the posterior parts of the fins; caudal blackish; pectorals and pelvics dusky.

Hab. Coasts of south-east Africa.

In the British Museum a single specimen, 408 mm. in total length.

Lepidion lepidion (Risso).

Gadus lepidion, Risso, 1810, *Ich. Nice*, p. 118.
Lotta lepidion, Risso, 1826, *H.N. Europe*, III, p. 218.
Lepidion rissoi, Swainson, 1838, *N.H. Fishes etc.*, I, p. 319.
Lepidion rubescens, Swainson, 1839, *N.H. Fishes etc.*, II, p. 300.
Haloporphyrus lepidion, Giglioli, 1880, *Nature*, XXI, p. 202; Vinciguerra, 1883, *Ann. Mus. Civ. stor. nat. Genova*, XVIII, p. 554, pl. iii; Günther, 1887, *Deep-Sea Fish. 'Challenger'*, p. 91; Carus, 1889–93, *Prodr. Faun. Medit.*, II, p. 576; Goode and Bean, 1895, *Ocean. Ichth.*, p. 370, fig. 323.

Hab. Western Mediterranean.

In the British Museum a single specimen, 253 mm. in total length, from Nice.

Lepidion eques (Günther).

Haloporphyrus eques, Günther, 1887, *t.c.*, p. 91, pl. xviii, fig. B; Holt and Calderwood, 1895, *Sci. Trans. R. Dublin Soc.*, V (II), p. 446, pl. xxxix, figs. 1, 2; Koehler, 1896, *Ann. Univ. Lyon*, XXVI, p. 487; Lütken, 1898, *Danish Ingolf Exped.*, II, 1. *Ichth. Res.*, p. 30, pl. iv, fig. 7.

[1] Gilchrist gives 8 rays in the first dorsal, but this is probably an error.

Lepidion eques, Goode and Bean, 1895, *Ocean. Ichth.*, p. 371; Collett, 1905, *Rep. Norweg. Fish. Mar.-Invest.*, II (3), p. 69; Koefoed, 1926, *Rep. Sci. Res. 'Michael Sars' N. Atlant. Exped.* 1910, IV (1), *Zool.*, p. 124, fig. 50.

Haloporphyrus lepidion var. *eques*, Roule, 1919, *Rés. Camp. Sci. Monaco*, LII, p. 78.

Hab. Eastern Atlantic.

In the British Museum several specimens, up to 350 mm. in total length, including the types of the species.

Very closely related to, or perhaps identical with *L. lepidion.*

Lepidion inosimae (Günther).

Haloporphyrus inosimae, Günther, 1887, *t.c.*, p. 92, pl. XX, fig. B.

Hab. Inosima, Japan.

In the British Museum 4 specimens, 212–305 mm. in total length—types of the species.

Lepidion capensis, Gilchrist.

Lepidion capensis, Gilchrist, 1922, *Rep. Fish. Mar. Biol. Surv. S. Afric.*, II (1921), Spec. Rep. III, p. 61; Barnard, 1925, *Ann. S. Afr. Mus.*, XXI, p. 324, pl. xiii, fig. 1.

Hab. South Africa.

In the British Museum 7 specimens, 310–500 mm. in total length.

Lepidion ensiferus (Günther).

Haloporphyrus ensiferus, Günther, 1887, *t.c.*, p. 92, pl. xix, fig. A.

Hab. Off the mouth of the Rio Plata.

In the British Museum 4 specimens, 265–350 mm. in total length—types of the species.

Lepidion modestus (Franz).

Haloporphyrus modestus, Franz, 1910, *Abh. K. Bayer. Akad. Wiss. Münch.*, Suppl. IV, Abh. 1, p. 28, pl. iv, fig. 13.

Hab. Yokohama, Japan.

Only the type known, 340 mm. in total length.

TRACHICHTHYIDAE

Hoplostethus mediterraneus, Cuv. and Val.

Barnard, 1925, *Ann. S. Afr. Mus.*, XXI, p. 362.

St. J. 1 specimen, 165 mm.

Hoplostethus atlanticus, Collett.

Collett, 1889, *Bull. Soc. zool. Fr.*, XIV, p. 306; Goode and Bean, 1895, *Ocean. Ichth.*, p. 189.

St. J. 9 specimens, 210–430 mm.

This species is readily distinguished from the preceding by the relatively smaller eye, smaller scales, indistinct abdominal scutes, higher number of dorsal rays, etc. It was not included by Barnard in his South African monograph.

ZEIDAE

Zeus capensis, Cuv. and Val.

Barnard, 1925, *Ann. S. Afr. Mus.*, XXI, p. 373, pl. xvi, fig. 3.

St. A. 2 specimens, 190, 210 mm.

Pseudocyttus maculatus, Gilchrist.

Barnard, *t.c.*, p. 376.

St. J. 7 specimens, 210–445 mm.

Neocyttus rhomboidalis, Gilchrist.

Barnard, *t.c.*, p. 377.

St. J. 3 specimens, 100–105 mm.

Allocyttus verrucosus Gilchrist.

Barnard, *t.c.*, p. 378, pl. xvi, fig. 4.

St. J. 19 specimens, 100–395 mm.

CARANGIDAE

Trachurus trachurus (Linn.).

Barnard, 1927, *Ann. S. Afr. Mus.*, XXI, p. 531, pl. xxiii, fig. 1.

1 specimen, 380 mm., presented by Messrs Irvine and Johnstone.

BRAMIDAE

Brama raii (Bloch.).

Barnard, 1927, *Ann. S. Afr. Mus.*, XXI, p. 594, pl. xxiv, fig. 3.

St. D. 1 specimen, 520 mm.
St. G. 2 specimens, 500, 570 mm.
St. ?. 1 specimen, 610 mm.

SCIAENIDAE

Umbrina capensis, Pappe.

Barnard, 1927, *Ann. S. Afr. Mus.*, XXI, p. 578, pl. xxiii, fig. 4.

1 specimen, 360 mm., presented by Messrs Irvine and Johnstone.

SPARIDAE

Dentex rupestris, Cuv. and Val.

Barnard, 1927, *Ann. S. Afr. Mus.*, XXI, p. 714.

St. 90. 11. vii. 26. Large gauze fish-trap, 10 m.: 1 specimen, 68 mm.

Dentex argyrozona, Cuv. and Val.

Barnard, *t.c.*, p. 717.

1 specimen, 340 mm., presented by Messrs Irvine and Johnstone.

Pachymetopon blochi (Cuv. and Val.).

Norman, 1935, *Ann. S. Afr. Mus.*, XXXII, p. 12, fig. 3.

St. 90. 11–12. vii. 26. Hand line and large gauze fish-trap, 10 m.: 2 specimens, 85, 200 mm.

Sparus globiceps (Cuv. and Val.).

Barnard, *t.c.*, p. 685.

1 specimen, 350 mm., presented by Messrs Irvine and Johnstone.

Diplodus rondeleti (Cuv. and Val.), var. **capensis**, Smith.

Barnard, *t.c.*, p. 691.

St. 90. 10. vii. 26. Hand line, 10 m.: 1 specimen, 300 mm.

Pagrus laniarius, Cuv. and Val.

Barnard, *t.c.*, p. 694, fig. 24.

1 specimen, 390 mm., presented by Messrs Irvine and Johnstone.

CLINIDAE

Clinus taurus, Gilchrist and Thompson.

Barnard, 1927, *Ann. S. Afr. Mus.*, XXI, p. 858.

29. vi. 27. Simon's Town. 1 specimen, 122 mm.

Found while draining the dry dock.

BROTULIDAE

Bidenichthys capensis, Barnard.

1934, *Ann. Mag. Nat. Hist.* (10) XIII, p. 234, fig. 3.

St. 90. 11. vii. 26. Hand net, 1–2 m.: 1 specimen, 45 mm.

This interesting little fish is new to the British Museum collection.

OPHIDIIDAE

Genypterus capensis (Smith).

Barnard, 1927, *Ann. S. Afr. Mus.*, XXI, p. 887, pl. XXXV, fig. 5.

St. D. 4 specimens, 440–475 mm.
St. P. 3 specimens, 700–770 mm.

This species is closely related to the Australian and New Zealand *G. blacodes* (Schn.), but may be recognized by the smaller eye.

SCORPAENIDAE

Helicolenus maculatus (Cuv. and Val.).

Barnard, 1927, *Ann. S. Afr. Mus.*, XXI, p. 907.

St. C. 4 specimens, 304–360 mm.
St. ?. 1 specimen, 350 mm.

Scorpaena (??) **capensis**, Gilchrist and von Bonde.[1]

Sebastosemus capensis, Barnard, *t.c.*, p. 910.

St. J. 2 specimens, 370, 400 mm.

[1] See note on p. 32 of this report.

TRIGLIDAE

Chelidonichthys capensis (Cuv. and Val.).

Barnard, 1927, *Ann. S. Afr. Mus.*, XXI, p. 940, pl. xxxiv, fig. 3, fig. 28 *c*.

St. A. 2 specimens, 405, 435 mm.

COTTUNCULIDAE

Cottunculoides inermis (Vaillant).

Barnard, 1927, *Ann. S. Afr. Mus.*, XXI, p. 923, pl. xxxiv, fig. 1.

St. J. 1 specimen, 267 mm.

TETRODONTIDAE

Tetrodon honckeni, Bloch.

Barnard, 1927, *Ann. S. Afr. Mus.*, XXI, p. 970, pl. xxxvi, fig. 6.

12. vii. 27. Simon's Town Dockyard. 2 specimens, 160, 195 mm.

LOPHIIDAE

Lophius piscatorius, Linn.

Barnard, 1927, *Ann. S. Afr. Mus.*, XXI, p. 999.

St. A. 1 specimen, 380 mm.
St. B. 1 specimen, 150 mm.

ASCENSION ISLAND

28 specimens were collected at this locality, representing 12 species.

SERRANIDAE

Paranthias furcifer (Cuv. and Val.).

St. 1. 16. xi. 25. Medium rectangular net, 16–27 m.: 1 specimen, 72 mm.

CARANGIDAE

Trachurops crumenophthalmus (Bloch).

St. 2. 17. xi. 25. Shore collection—rock pools: 2 specimens, 200, 225 mm.

POMACENTRIDAE

Glyphisodon saxatilis (Linn.).

St. 2. 17. xi. 25. Shore collection—rock pools: 7 specimens, 22–165 mm.

Pomacentrus leucostictus, Müll. and Trosch.

St. 1. 16. xi. 25. Medium rectangular net, 16–27 m.: 2 specimens, 60, 69 mm.

LABRIDAE

Thalassoma ascensionis (Quoy and Gaim.).

St. 2. 17. xi. 25. Shore collection—rock pools: 1 specimen, 105 mm.

BLENNIIDAE

Rupiscartes atlanticus (Cuv. and Val.).

St. 2. 17. xi. 25. Shore collection—rock pools: 1 specimen, 140 mm.

Salariichthys textilis (Quoy and Gaim.).

St. 2. 17. xi. 25. Shore collection—rock pools: 6 specimens, 23–60 mm.

MUGILIDAE

Myxus (?) curvidens (Cuv. and Val.).

St. 2. 17. xi. 25. Shore collection—rock pools: 2 specimens, 47, 100 mm.

SCORPAENIDAE

Scorpaena scrofina, Cuv. and Val.

St. 1. 16. xi. 25. Medium rectangular net, 16–27 m.: 2 specimens, 44, 48 mm.

BALISTIDAE

Balistes vetula, Linn.

St. 1. 16. xi. 25. Medium rectangular net, 16–27 m.: 1 specimen, 70 mm.

Melichthys piceus (Poey).

St. 2. 17. xi. 25. Shore collection—rock pools: 1 specimen, 175 mm.

ANTENNARIIDAE

Antennarius multiocellatus (Cuv. and Val.).

St. 1. 16. xi. 25. Medium rectangular net, 16–27 m.: 1 specimen, 9 mm.

Another specimen, 70 mm. long, was presented by Mr L. W. Shaw.

In comparison with the fishes of St Helena, which have been dealt with by Günther, Melliss, Cunningham, and Clark,[1] among others, those of Ascension have been somewhat neglected. The island was visited by Osbeck,[2] who listed 9 species, several afterwards utilized by Linnaeus. More than a hundred years later the 'Challenger' made a small collection here, which was reported upon by Günther,[3] who also recorded 3 further species in the following year.[4] Nichols and Murphy[5] published a note on *Balistes vetula* from Ascension, and, finally, in 1919 Fowler[6] recorded about a dozen species, and also described a new species of *Abudefduf* (= *Glyphisodon*), which may also occur at St Helena.

[1] For references to these papers see, Fowler, 1919, *Proc. U.S. Nat. Mus.*, LVI, p. 217.
[2] 1765, *Reise Ost.-Ind. China*, pp. 385–96.
[3] 1880, *Shore Fish. 'Challenger'*, p. 5.
[4] 1881, *Ann. Mag. Nat. Hist.* (5) VIII, pp. 430–40.
[5] 1917, *Copeia*, No. 39, p. 2.
[6] *T.c.*, pp. 217–27.

Species	St Helena	West Indies	Brazil	West Africa[1]	South Africa	
Carcharinus obscurus (Le Sueur)	.	×	×	×	×	Atlantic
Lycodontis moringa (Cuv.)	×	×	×	.	.	
Tylosurus caribbaeus (Le Sueur)	.	×	.	.	.	
Belone ardeola, Cuv. & Val.	×	×	.	×	.	
Exocoetus bahiensis, Ranzani	.	×	×	×	×	Atlantic
Aulostomus maculatus, Val.	×	×	×	.	.	
Myripristis jacobus, Cuv. & Val.	×	×	×	.	.	
Holocentrum adscensionis (Osbeck)	×	×	×	×	.	
Epinephelus aeneus (Geoffr.)	.	.	.	×	.	Mediterranean
Epinephelus adscensionis (Osbeck)	×	×	×	×	×	
Paranthias furcifer (Cuv. & Val.)	.	×	×	.	.	Pacific coast, trop. America
Rypticus saponaceus (Schn.)	×	×	×	×	×	
Priacanthus cruentatus (Lacep.)	×	×	.	×	×	Pacific
Apogon axillaris, Val.	×	.	.	.	.	
Malacanthus plumieri (Bloch)	.	×	×	.	.	
Decapterus sanctae helenae (Cuv. & Val.)	×	×	×	×	.	
Caranx lugubris, Poey	×	×	×	.	× ?	Atlantic and Pacific
Caranx hippos (Linn.)	×	×	×	×	×	Atlantic and Pacific
Trachurops crumenophthalmus (Bloch)	.	×	×	×	×	Atlantic and Pacific
Trachinotus glaucus (Linn.)	×	.	× ?	×	×	Mediterranean
Upeneus martinicus, Cuv. & Val.	.	×	×	.	.	
Diplodus argenteus (Cuv. & Val.)	.	×	×	.	.	
Chaetodon sanctae-helenae, Günth.	×	.	.	.	.	
Pomacanthus paru (Bloch)	.	×	×	.	.	
Glyphisodon saxatilis (Linn.)	×	×	×	×	.	Pacific coast, trop. America
Glyphisodon ascensionis (Fowler)	× ?	.	.	.	.	
Chromis marginatus (Cast.)	×	.	×	.	.	
Pomacentrus leucostictus, Müll. & Tr.	×	×	×	× ?	.	
Thalassoma ascensionis (Quoy & Gaim.)	×	.	.	.	.	
Harpe rufa (Linn.)	×	×	×	.	.	
Pseudoscarus guacamaia (Cuv.)	.	×	×	×	.	
Teuthis hepatus (Linn.)	×	×	×	×	.	
Blennius cristatus, Linn.	.	×	×	×	×	
Rupiscartes atlanticus (Cuv. & Val.)	×	×	×	×	.	Pacific coast, trop. America
Alticus textilis (Cuv. & Val.)	×	×	×	.	.	
Ophioblennius webbi (Val.)	.	×	×	×	.	
Mugil cephalus, Linn.	.	×	×	×	×	Mediterranean; Pacific coast of America
Myxus curvidens (Cuv. & Val.)	.	.	×	×	.	
Echeneis naucrates, Linn.	× ?	×	×	×	×	All warm seas
Scorpaena plumieri, Bloch	.	×	×	.	.	
Scorpaena scrofina, Cuv. & Val.	×	.	.	.	.	
Dactylopterus volitans (Linn.)	.	×	×	×	×	Atlantic
Bothus mellissi, Norman	×	.	.	.	.	
Alutera scripta (Osbeck)	.	×	×	×	.	Pacific (?)
Canthidermis maculatus (Bloch)	.	×	×	.	×	Pacific (?)
Balistes vetula, Linn.	.	×	×	.	×	
Melichthys piceus (Poey)	×	×	×	.	.	
Lactophrys tricornis (Linn.)	×	×	×	×	.	
Antennarius multiocellatus (Cuv. & Val.)	.	×	×	.	.	

[1] Including Madeira, Canaries, Cape Verde Islands, etc.

In addition to the earlier collections made by H.M.S. 'Challenger' (1873–76), Mr T. Conry (1881), and Dr A. McCloy (1908), the British Museum has received two larger and valuable lots from Ascension in recent years, one presented in 1927 by Dr J. J. Simpson of the Liverpool Public Museum, the other presented in 1932 by Colonel S. T. Haley. With this material available, it seems desirable to draw up a provisional list of the fishes recorded from the island, and to indicate in the form of a table the distribution of the various species. A glance at this table shows at once that the fauna, like that of St Helena, is predominantly West Indian and Brazilian in character. Of the 49 species recorded, 27 or 28 occur also at St Helena, and doubtless others will be found to be common to the two islands. A certain number of the species also appear to occur on the coast of West Africa, but many of the records from this region are unreliable.

TRISTAN DA CUNHA

Examples of 3 species were obtained here, including a fine specimen of a new species of *Decapterus*, which has been described and figured by me elsewhere.

CARANGIDAE

Decapterus longimanus, Norman.

1935, *Ann. Mag. Nat. Hist.* (10) xvi, p. 255, fig. 1.

St. 4. 30–31. i. 26. Hand line, 40 m.: 1 specimen (holotype), 470 mm.

CHILODACTYLIDAE

Acantholatris monodactylus (Carmichael).

Chaetodon monodactylus, Carmichael, 1818, *Trans. Linn. Soc.*, xii, p. 500, pl. xxiv.
Chilodactylus carmichaelis, Cuvier and Valenciennes, 1830, *Hist. Nat. Poiss.*, v, p. 360; Kner, 1869, *Reise 'Novara'*, *Zool.* 1, 5. *Fische*, p. 90, pl. v, fig. 1.
Chilodactylus monodactylus, Regan, 1913, *Ann. Mag. Nat. Hist.* (8) xi, p. 466.

This species was redescribed and figured by Kner from St Paul Island, in the same latitude as Tristan da Cunha but 4500 miles distant. There are in the British Museum collection two small specimens from Tristan da Cunha presented by the South African Museum, and another larger one from the same locality collected by the Shackelton-Rowett Expedition ('Quest'). This species is quite distinct from the Chilean *Acantholatris gayi* (Kner), of which the 'Challenger' obtained two fine examples from Juan Fernandez.[1]

SCORPAENIDAE

Sebastichthys capensis (Gmelin).

Barnard, 1927, *Ann. S. Afr. Mus.*, xxi, p. 908.

St. 4. 30–31. i. 26. Hand line, 40 m.: 1 specimen, 340 mm.

Also obtained from Gough Island ('Scotia' and 'Quest').

[1] The Chilean form is well described by Cuvier and Valenciennes (1833, *H.N. Poiss.*, ix, p. 489) as *Cheilodactylus carmichaelis*, and it was subsequently figured by Valenciennes (1850, in Cuvier, *R. Anim.*, Discip. Ed., *Poiss.* pl. xxxi, fig. 2).

GOUGH ISLAND

Examples of only 2 species were obtained from this locality.

CHILODACTYLIDAE

Acantholatris monodactylus (Carmichael).

St. WS 123. 8. vi. 27. Hand line, 47–72 m.: 1 specimen (head only), 110 mm.

BOVICHTHYIDAE

Bovichtus diacanthus (Carmichael).

Callionymus diacanthus, Carmichael, 1818, *Trans. Linn. Soc.*, XII, p. 501, pl. XXVI.
Bovichthys diacanthus, Günther, 1860, *Cat. Fish.*, II, p. 249; Regan, 1913, *Ann. Mag. Nat. Hist.*, (8) XI, p. 467; Regan, 1913, *Trans. R. Soc. Edinb.*, XLIX, pp. 239, 256, pl. ix, fig. 5.

St. WS 123. 9. vi. 27. Shore collection: 3 specimens, 200–245 mm.

Originally described from Tristan da Cunha, this species was taken by the 'Scotia' at Gough Island. Regan has shown that it is distinct from the Chilean form, *B. chilensis*, Regan. It is represented at the Island of St Paul by a closely related species, *B. veneris*, Sauvage.

APPENDIX

A certain number of flying fishes were obtained by the Expedition, and the specimens are being studied by Dr Anton F. Bruun of the Marinbiologisk Laboratorium, Copenhagen, who has undertaken a general revision of the Exocoetidae of the Atlantic. He has kindly furnished me with the following identifications of specimens from areas covered by the present report.

EXOCOETIDAE

Oxyporhamphus micropterus (Cuv. and Val.).

St. 289. 23. viii. 27. 3° 04′ 45″ N, 16° 52′ W. Hand net: 2 specimens, 182, 189 mm.
St. 294. 25. viii. 27. 4° 33′ 15″ N, 16° 52′ 45″ W. Hand net: 1 specimen, *ca.* 163 mm.

Exocoetus volitans, Linn.

11. xi. 25. 1° 04′ S, 12° 50′ W. Flew on board: 1 specimen, 204 mm.
17. iv. 33. 3° 21′ S, 8° 37′ W. On deck: 1 specimen, *ca.* 176 mm.

Exocoetus obtusirostris, Günth.

26. x. 25. 16° 19′ N, 18° 24′ W. Flew on board: 1 specimen, *ca.* 176 mm.
25. x. 25. 17° 30′ N, 18° 16′ W. Flew on board: 1 specimen, 212 mm.

Cypsilurus cyanopterus (Cuv. and Val.).

6. v. 32. 19° 06′ S, 38° 39′ W. On deck: 1 specimen, *ca.* 167 mm.

Cypsilurus lineatus (Cuv. and Val.).

24. x. 25. 21° 00′ N, 18° 05′ W. Flew on board: 1 specimen, *ca.* 427 mm.

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POLYCHAETE WORMS. II

By

C. C. A. MONRO, M.A.
Assistant Keeper in the Department of Zoology,
British Museum

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Assistant Keeper in the Department of Zoology, British Museum

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INTRODUCTION

The Polychaeta studied in this report were collected by the staff of the Discovery Committee in the R.R.S. 'Discovery' and 'Discovery II', in the 'William Scoresby', and at the Marine Biological Station, South Georgia. There follows a list of the stations. Those made by the 'Discovery' and the 'Discovery II' are given first and have no letters prefixed to their numbers; those of the 'William Scoresby' follow, and have the prefix WS, and lastly those of the Marine Biological Station are preceded by MS. The symbols in the list of stations representing the various kinds of gear used are explained both in my earlier report (1930) on the Discovery Polychaeta and in the Station Lists published in this series of Reports.

STATION LIST

R.R.S. 'DISCOVERY'

St. 17. 4. iii. 26. 46 miles N 46° E of Jason Light, South Georgia. 500–250 m. Gear **N 70 V**.

St. 27. 15. iii. 26. West Cumberland Bay, South Georgia; 3·3 miles S 44° E of Jason Light. 110 m. Gear **DL**. Bottom: mud and rock.

St. 28. 16. iii. 26. West Cumberland Bay, South Georgia; 3·3 miles S 45° W of Jason Light. 168 m. Gear **DC**. Bottom: mud.

St. 30. 16. iii. 26. West Cumberland Bay, South Georgia; 2·8 miles S 24° W of Jason Light. 251 m. Gear **DLH**. Bottom: mud and stones.

St. 39. 25. iii. 26. East Cumberland Bay, South Georgia. From 8 cables S 81° W of Merton Rock to 1·3 miles N 7° E of Macmahon Rock. 179–235 m. Gear **N 4–T**. Bottom: grey mud.

St. 41. 28. iii. 26. 16½ miles N 39° E of Banff Point, South Georgia. Gear **N 70 V**.

St. 41 A. 265–150 m.; St. 41 B. 265–150 m.; St. 41 D. 240–150 m.; St. 41 E. 150–100 m.

St. 42. 1. iv. 26. Off mouth of Cumberland Bay, South Georgia. From 6·3 miles N 89° E of Jason Light to 4 miles N 39° E of Jason Light. 120–204 m. Gear **OTL**. Bottom: mud.

St. 45. 6. iv. 26. 2·7 miles S 85° E of Jason Light, South Georgia. 238–270 m. Gear **OTL**. Bottom: grey mud.

St. 53. 12. v. 26. Port Stanley, East Falkland Island. Hulk of 'Great Britain'. 0–2 m. Gear **RM**.

St. 100. 2. x. 26. 33° 20′ to 33° 46′ S, 15° 18′ to 15° 08′ E. 260–310 m. Gear **TYF**.

St. 114. 12. xi. 26. 52° 25′ S, 9° 50′ E. 0–5 m. Gear **N 100 H**.

St. 123. 15. xii. 26. Off mouth of Cumberland Bay, South Georgia. From 4·1 miles N 54° E of Larsen Point to 1·2 miles S 62° W of Larsen Point. 230–250 m. Gear **OTL, NCS–T**. Bottom: grey mud.

St. 124. 18. xii. 26. 53° 45′ 30″ S, 36° 32′ 30″ W. 0–5 m. Gear **N 100 H.**

St. 128. 19. xii. 26. 53° 38′ 30″ S, 37° 08′ W. 100 m. Gear **N 100 H.**

St. 130. 20. xii. 26. 54° 06′ S, 36° 23′ W. 77 m. Gear **N 100 H.**

St. 133. 20–21. xii. 26. 53° 45′ 30″ S, 35° 46′ 30″ W. 0–5 m., 50 m., 100 m. Gear **N 100 H.**

St. 136. 21. xii. 26. 54° 22′ S, 35° 21′ W. 0–5 m. Gear **N 100 H.**

St. 137. 22. xii. 26. 54° 19′ 30″ S, 35° 03′ 30″ W. 132 m. Gear **N 100 H.**

St. 138. 22. xii. 26. 54° 17′ S, 34° 47′ W. 77 m., 155 m. Gear **N 100 H.**

St. 139. 22–23. xii. 26. 53° 30′ 15″ S, 35° 50′ 45″ W. 0–5 m. Gear **N 100 H.**

St. 142. 30. xii. 26. East Cumberland Bay, South Georgia. From 54° 11′ 30″ S, 36° 35′ W to 54° 12′ S, 36° 29′ 30″ W. 88–273 m. Gear **NCS–T.** Bottom: mud.

St. 144. 5. i. 27. Off mouth of Stromness Harbour, South Georgia. From 54° 04′ S, 36° 27′ W to 53° 58′ S, 36° 26′ W. 155–178 m. Gear **NCS-T.** Bottom: green mud and sand.

St. 149. 10. i. 27. Mouth of East Cumberland Bay, South Georgia. From 1·15 miles N 76½° W to 2·62 miles S 11° W of Merton Rock. 200–234 m. Gear **NCS–T.** Bottom: mud.

St. 151. 16. i. 27. 53° 25′ S, 35° 15′ W. 1000–750 m. Gear **N 70 V.**

St. 156. 20. i. 27. 53° 51′ S, 36° 21′ 30″ W. 200–236 m. Gear **DLH.** Bottom: rock.

St. 160. 7. ii. 27. Near Shag Rocks, South Georgia, 53° 43′ 40″ S, 40° 57′ W. 100–50 m., gear **N 70 V**; 177 m., gear **DLH.** Bottom: grey mud, stones and rock.

St. 164. 18. ii. 27. East end of Normanna Strait, South Orkneys near Cape Hansen, Coronation Island. 24–36 m. Gear **BTS, NCS–T.**

St. 167. 20. ii. 27. Off Signy Island, South Orkneys, 60° 50′ 30″ S, 46° 15′ W. 244–344 m. Gear **N 7–T.** Bottom: green mud.

St. 170. 23. ii. 27. Off Cape Bowles, Clarence Island, 61° 25′ 30″ S, 53° 46′ W. 342 m. Gear **DLH.** Bottom: rock.

St. 175. 2. iii. 27. Bransfield Strait, South Shetlands, 63° 17′ 20″ S, 59° 48′ 15″ W. 200 m. Gear **DLH.** Bottom: mud, stones and gravel.

St. 182. 14. iii. 27. Schollaert Channel, Palmer Archipelago, 64° 21′ S, 62° 58′ W. 278–500 m. Gear **NCS–T.** Bottom: mud.

St. 190. 24. iii. 27. Bismarck Strait, Palmer Archipelago, 64° 56′ S, 65° 35′ W. 93–126 m. Gear **DLH.** Bottom: stones, mud and rock.

St. 268. 25. vii. 27. 18° 37′ S, 10° 46′ E. 73–0 m. Gear **N 100 B.**

St. 274. 4. viii. 27. Off St Paul de Loanda, Angola. From 8° 40′ 15″ S, 13° 13′ 45″ E to 8° 38′ 15″ S, 13° 13′ E. 64–65 m. Gear **OTL.** Bottom: grey mud.

R.R.S. 'DISCOVERY II'

St. 334. 4. ii. 30. 53° 43′ S, 36° 51′ W. 110–0 m. Gear **N 70 B.**

St. 362. 25. ii. 30. 56° 04′ S, 29° 15′ W to 56° 03¼′ S, 29° 20′ W. 97–0 m. Gear **N 100 B.**

St. 363. 26. ii. 30. 2·5 miles S 80° E of SE point of Zavodovski Island, South Sandwich Islands. 329–278 m. Gear **DLH.**

St. 366. 6. iii. 30. 4 cables S of Cook Island, South Sandwich Islands. 322–155 m. Gear **DLH.** Bottom: black sand.

St. 368. 8. iii. 30. Douglas Strait, Southern Thule, South Sandwich Islands, 1 mile N of Twitcher Rock. 653 m. Gear **DLH.** Bottom: black mud.

St. 371. 14. iii. 30. 1 mile E of Montagu Island, South Sandwich Islands. 99–161 m. Gear **OTL, N 7–T, N 4–T.**

St. 373. 19. iii. 30. 58° 00′ S, 33° 44′ W. 275–0 m. Gear **TYFB**.

St. 374. 20. iii. 30. 57° 55′ S, 37° 30′ W. 270–0 m. Gear **TYFB**.

St. 395. 13. v. 30. 48° 26¾′ S, 22° 10′ W to 48° 26½′ S, 22° 06½′ W. 1500–1600 m. Gear **N 450 H**.

St. 399. 18. v. 30. 1 mile SE of SW point of Gough Island. 141–102 m. Gear **DLH**.

St. 404. 24. v. 30. 35° 34′ S, 15° 00½′ E. 101–0 m. Gear **N 100 B**.

St. 405. 4. vi. 30. 33° 50½′ S, 15° 46′ E to 34° 16′ S, 15° 02′ E. 1200–0 m. Gear **TYFB**.

St. 407. 12. vi. 30. 35° 13′ S, 17° 50½′ E to 34° 57′ S, 17° 48′ E. 220–0 m. Gear **TYFB**.

St. 413. 21. viii. 30. 33° 13′ S, 15° 46½′ E. 550–350 m., 350–0 m. Gear **TYFB**.

St. 419. 30. viii. 30. 36° 29′ S, 18° 16¼′ E to 36° 29′ S, 18° 15¼′ E. 84–0 m. Gear **N 100 B**.

St. 446. 9. x. 30. 36° 14′ S, 16° 09¾′ E. 106–0 m. Gear **N 100 B**.

St. 448. 10. x. 30. 39° 03′ S, 16° 11¾′ E. 161–0 m. Gear **N 100 B**.

St. 449. 11–12. x. 30. 42° 30½′ S, 15° 14¼′ E. 150–0 m. Gear **N 100 B**.

St. 450. 12–13. x. 30. 44° 57¾′ S, 12° 57¼′ E to 44° 56½′ S, 12° 54′ E. 150–0 m. Gear **N 100 B**.

St. 451. 13–14. x. 30. 47° 19¾′ S, 11° 05′ E. 170–0 m. Gear **N 100 B**.

St. 453. 16–17. x. 30. 54° 05½′ S, 3° 57¼′ E to 54° 07′ S, 04° 03′ E. 165–0 m. Gear **N 100 B**.

St. 454. 17. x. 30. 53° 42′ S, 4° 42′ E. 192–0 m. Gear **N 100 B**.

St. 455. 18. x. 30. 53° 55½′ S, 4° 47′ E. 116–0 m. Gear **N 100 B**.

St. 456. 18. x. 30. 1 mile E of Bouvet Island. 40–45 m. Gear **DLH**.

St. 458. 19. x. 30. 7 miles S 50° W of Cape Circumcision, Bouvet Island. 357–377 m. Gear **DLH**.

St. 459. 19. x. 30. 55° 09¼′ S, 2° 00′ E. 183–0 m. Gear **N 100 B**.

St. 460. 20–21. x. 30. 56° 46′ S, 0° 41¾′ W. 155–0 m. Gear **N 100 B**.

St. 461 C. 21–22. x. 30. 56° 44′ S, 2° 22′ W. (No particulars of depth or gear given on label with specimens.)

St. 474. 12. xi. 30. 1 mile W of Shag Rocks, South Georgia. 199 m. Gear **DLH**.

St. 514. 26. xi. 30. 55° 51′ S, 35° 32′ W. 155–0 m. Gear **N 100 B**.

St. 527. 11. xii. 30. 54° 09¼′ S, 34° 29½′ W. 122 (–0) m. Gear **N 450 H**.

St. 533. 16. xii. 30. 59° 36′ S, 42° 34′ W. 165–0 m. Gear **N 100 B**.

St. 567. 3. i. 31. 66° 45′ S, 89° 24′ W. 140–0 m. Gear **N 100 B**.

St. 569. 4. i. 31. 68° 40½′ S, 96° 21′ W. 137–0 m. Gear **N 100 B**.

St. 575. 8. i. 31. 67° 53¼′ S, 91° 23′ W. 97–0 m. Gear **N 100 B**.

St. 579. 10. i. 31. 66° 41¾′ S, 79° 10′ W. 180–0 m. Gear **N 100 B**.

St. 588. 13. i. 31. 66° 11½′ S, 71° 50¼′ W. 460–150 m. Gear **N 100 B**.

St. 590. 14. i. 31. 65° 20½′ S, 73° 30½′ W. 1150–1400 m. Gear **TYFH**.

St. 591. 14. i. 31. 64° 51½′ S, 74° 22½′ W. 122–0 m. Gear **N 100 B**.

St. 599. 17. i. 31. 67° 08′ S, 69° 06½′ W. 203 m. Gear **DLH**.

St. 600. 17. i. 31. 67° 09′ S, 69° 27′ W. 501–527 m. Gear **OTL**.

St. 619. 19. ii. 31. 59° 33′ S, 43° 07¼′ W. 114–0 m. Gear **N 70 B**.

St. 652. 14. iii. 31. Burdwood Bank, 54° 04′ S, 61° 40′ W. 171–169 m. Gear **OTL**.

St. 701. 16. x. 31. 14° 39·3′ N, 25° 51·7′ W. 242–0 m. Gear **TYFB**.

St. 702. 17. x. 31. 10° 59·3′ N, 27° 03·8′ W. 236–0 m. Gear **TYFB**.

St. 704. 19. x. 31. 3° 37·7′ N, 29° 14′ W. 231–0 m. Gear **TYFB**.

St. 705. 20. x. 31. 0° 03·4′ N, 30° 36·8′ W. 150–0 m. Gear **TYFB**.

St. 707. 22. x. 31. 6° 44′ S, 33° 33′ W. 182–0 m. Gear **TYFB**.

St. 708. 23. x. 31. 10° 20·6′ S, 34° 54·7′ W. 208–0 m. Gear **TYFB**.

St. 709. 24. x. 31. 14° 01·4′ S, 36° 30·7′ W. 216–0 m. Gear **TYFB**.

St. 710. 26. x. 31. 21° 45′ S, 39° 50′ W. 294–0 m. Gear **TYFB**.

St. 713. 29. x. 31. 31° 37·1′ S, 45° 00′ W. 200–0 m. Gear **TYFB**.

St. 714. 30. x. 31. 35° 09·5′ S, 47° 00′ W. 246–0 m. Gear **TYFB**.

St. 716. 1. xi. 31. 42° 08·8′ S, 51° 35′ W. 212–0 m. Gear **TYFB**.

St. 718. 3. xi. 31. 47° 27·2′ S, 55° 10·2′ W. 262–0 m. Gear **TYFB**.

St. 724. 16. xi. 31. Fortescue Bay, Magellan Strait. 0–5 m. Gear **NS**.

St. 929. 16. viii. 32. 34° 21′ S, 172° 48′ E to 34° 22·2′ S, 172° 49·8′ E. 58–55 m. Gear **OTL**.

St. 934. 17. viii. 32. 34° 11·6′ S, 172° 10·9′ E to 34° 11·4′ S, 172° 10·3′ E. 98–0 m. Gear **DRL**.

St. 935. 17. viii. 32. 34° 11·5′ S, 172° 08·5′ E to 34° 11·9′ S, 172° 08·5′ E. 84–0 m. Gear **DRL**.

St. 936. 18. viii. 32. 35° 03·5′ S, 172° 58·2′ E to 35° 05·4′ S, 172° 58·7′ E. 50–0 m., gear **DC**; 50–57 m., gear **N 4–T**.

St. 937. 18. viii. 32. 35° 18·7′ S, 173° 08·2′ E. 48–0 m. Gear **DC**.

St. 938. 18. viii. 32. 35° 30·6′ S, 173° 19′ E. 37–0 m. Gear **DC**.

St. 939. 18. viii. 32. 35° 49·6′ S, 173° 27′ E to 35° 51·6′ S, 173° 28·9′ E. 87–87 m. Gear **N 4–T**, **DC**.

St. 941. 20. viii. 32. 40° 51·4′ S, 174° 48·2′ E to 40° 55·8′ S, 174° 46·7′ E. 128–0 m. Gear **DRL**.

St. 1148. 9. iii. 33. 63° 52′ S, 0° 24·9′ W. 0–5 m. Gear **N 100 H**.

R.R.S. 'WILLIAM SCORESBY'

St. WS 4. 30. ix. 26. 32° 45′ S, 18° 10′ E. 45–47 m. Gear **DL**.

St. WS 20. 28. xi. 26. 53° 52′ 30″ S, 36° 00′ W. 190 m. Gear **N 100 H**.

St. WS 22. 30. xi. 26. 53° 38′ S, 35° 35′ W. 82 m. Gear **N 100 H**.

St. WS 25. 17. xii. 26. Undine Harbour (North), South Georgia. 18–27 m. Gear **BTS**. Bottom: mud and sand.

St. WS 26. 18. xii. 26. 53° 33′ 15″ S, 37° 45′ 15″ W. 96 m., 192 m. Gear **N 100 H**.

St. WS 27. 19. xii. 26. 53° 55′ S, 38° 01′ W. 107 m. Gear **N 100 H**.

St. WS 33. 21. xii. 26. 54° 59′ S, 35° 24′ W. 130 m. Gear **N 100 H**.

St. WS 35. 21–22. xii. 26. 55° 13′ 15″ S, 34° 59′ W. 0–5 m. Gear **N 100 H**.

St. WS 38. 22–23. xii. 26. 54° 01′ S, 35° 14′ W. 106 (–53) m. Gear **N 100 H**.

St. WS 39. 23. xii. 26. 54° 08′ S, 35° 43′ W. 87 ? m. Gear **N 100 H**.

St. WS 40. 7. i. 27. 55° 09′ S, 35° 58′ W. 175–100 m. Gear **N 70 V**.

St. WS 44. 8. i. 27. 55° 06′ S, 36° 57′ W. 750–500 m., 1000–750 m. Gear **N 70 V**.

St. WS 45. 8. i. 27. 54° 38′ 30″ S, 37° 30′ 55″ W. 0–5 m. Gear **N 100 H**.

St. WS 53. 11–12. i. 27. From 54° 03′ 30″ S, 38° 35′ W to 53° 29′ S, 37° 13′ 45″ W. 0–5 m. Gear **N 100 H**.

St. WS 54. 12. i. 27. 53° 29′ S, 37° 13′ 45″ W. 500–250 m. Gear **N 70 V**.

St. WS 55. 12. i. 27. 53° 15′ 30″ S, 37° 13′ 45″ W. 164 m. Gear **N 100 H**.

St. WS 79. 13. iii. 27. 51° 01′ 30″ S, 64° 59′ 30″ W. From 51° 00′ S, 65° 00′ W to 51° 03′ S, 64° 59′ W. 132–131 m. Gear **N 7–T**. Bottom: fine dark sand.

St. WS 83. 24. iii. 27. 14 miles S 64° W of George Island, East Falkland Island. From 52° 28′ S, 60° 06′ W to 52° 30′ S, 60° 09′ 30″ W. 137–129 m. Gear **OTC**. Bottom: fine green sand and shell.

St. WS 84. 24. iii. 27. $7\frac{1}{2}$ miles S 9° W of Sea Lion Island, East Falkland Islands. From 52° 33′ S, 59° 08′ W to 52° 34′ 30″ S, 59° 11′ W. 75–74 m. Gear **OTC**. Bottom: coarse sand, shell and stones.

St. WS 85. 25. iii. 27. 8 miles S 66° E of Lively Island, East Falkland Islands. From 52° 09′ S, 58° 14′ W to 52° 08′ S, 58° 09′ W. 79 m. Gear **OTC, N 7–T, N 4–T**. Bottom: sand and shell.

St. WS 90. 7. iv. 27. 13 miles N 83° E of Cape Virgins Light, Argentine Republic. From 52° 18′ S, 68° 00′ W to 52° 19′ 30″ S, 67° 57′ W. 82–81 m. Gear **OTC**. Bottom: fine dark sand.

St. WS 177. 7. iii. 28. 54° 58′ S, 35° 00′ W. 97–0 m. Gear **N 100 B**.

St. WS 200. 21. iv. 28. 59° 05′ S, 46° 32′ W. 93–0 m. Gear **N 100 B**.

St. WS 211. 29. v. 28. 50° 17′ S, 60° 06′ W. 161–174 m. Gear **N 4–T, NCS–T**. Bottom: green sand.

St. WS 212. 30. v. 28. 49° 22′ S, 60° 10′ W. 242–249 m. Gear **N 4–T, NCS–T**. Bottom: green sand, mud and pebbles.

St. WS 213. 30. v. 28. 49° 22′ S, 60° 10′ W. 249–239 m. Gear **NCS–T**. Bottom: green sand, mud and pebbles.

St. WS 214. 31. v. 28. 48° 25′ S, 60° 40′ W. 208–219 m. Gear **NCS–T, DC**. Bottom: fine dark sand.

St. WS 215. 31. v. 28. 47° 37′ S, 60° 50′ W. 219–146 m. Gear **DC, NCS–T**. Bottom: fine green sand.

St. WS 216. 1. vi. 28. 47° 37′ S, 60° 50′ W. 219–133 m. Gear **N 7–T**. Bottom: fine sand.

St. WS 219. 3. vi. 28. 47° 06′ S, 62° 12′ W. 116–114 m. Gear **NCS–T**. Bottom: dark sand.

St. WS 220. 3. vi. 28. 47° 56′ S, 62° 38′ W. 108–104 m. Gear **NCS–T**. Bottom: brown sand.

St. WS 221. 4. vi. 28. 48° 23′ S, 65° 10′ W. 76–91 m. Gear **OTC**. Bottom: brown sand, mud, pebbles, large stones and shell.

St. WS 223. 8. vi. 28. 49° 13′ S, 64° 52′ W. 114–114 m. Gear **OTC**. Bottom: coarse brown sand and shell.

St. WS 225. 9. vi. 28. 50° 20′ S, 62° 30′ W. 162–161 m. Gear **OTC**. Bottom: green sand, shell and pebbles.

St. WS 226. 10. vi. 28. 49° 20′ S, 62° 30′ W. 144–152 m. Gear **NCS–T**. Bottom: green sand.

St. WS 228. 30. vi. 28. 50° 50′ S, 56° 58′ W. 229–236 m. Gear **OTC, N 4–T, NCS–T**. Bottom: shell and coarse white sand.

St. WS 229. 1. vii. 28. 50° 35′ S, 57° 20′ W. 210–271 m. Gear **N 4–T**. Bottom: fine green sand.

St. WS 231. 4. vii. 28. 50° 10′ S, 58° 42′ W. 167–159 m. Gear **N 4–T, NCS–T**. Bottom: fine green sand.

St. WS 234. 5. vii. 28. 48° 52′ S, 60° 25′ W. 195–207 m. Gear **OTC, NCS–T**. Bottom: fine green sand.

St. WS 236. 6. vii. 28. 46° 55′ S, 60° 40′ W. 272–300 m. Gear **DC, N 4–T, NCS–T**. Bottom: dark green sand and mud.

St. WS 237. 7. vii. 28. 46° 00′ S, 60° 05′ W. 150–256 m. Gear **N 4–T, NCS–T**. Bottom: coarse brown sand and shell.

St. WS 239. 15. vii. 28. 51° 10′ S, 62° 10′ W. 196–193 m. Gear **OTC**. Bottom: coarse dark sand.

St. WS 243. 17. vii. 28. 51° 06′ S, 64° 30′ W. 144–141 m. Gear **OTC, N 4–T**. Bottom: coarse dark sand.

St. WS 244. 18. vii. 28. 52° 00′ S, 62° 40′ W. 253–247 m. Gear **N 7–T**. Bottom: fine dark sand and mud.

St. WS 245. 18. vii. 28. 52° 36′ S, 63° 40′ W. 304–290 m. Gear **N 4–T**. Bottom: dark green sand, madrepore, pebbles and shell.

St. WS 246. 19. vii. 28. 52° 25′ S, 61° 00′ W. 267–208 m. Gear **OTC, N 7–T, N 4–T**. Bottom: coarse green sand and pebbles.

St. WS 247. 19. vii. 28. 52° 40′ S, 60° 05′ W. 172 m. Gear **DLH**. Bottom: rock.

St. WS 248. 20. vii. 28. 52° 40′ S, 58° 30′ W. 210–242 m. Gear **OTC**. Bottom: fine green sand, pebbles and shell.

St. WS 249. 20. vii. 28. 52° 10′ S, 57° 30′ W. 166 m. Gear **DLH**. Bottom: fine brown-green sand, shell and stones.

St. WS 351. 11. i. 29. 54° 21′ 30″ S, 34° 59′ W. 750–500 m. Gear **N 70 V**.

St. WS 408. 26. ii. 29. 53° 50′ S, 62° 10′ W. 112–0 m. Gear **N 70 B**.

St. WS 411. 14. iii. 29. 52° 08′ S, 52° 35′ W. 100–0 m. Gear **N 70 B**.

St. WS 536. 24. i. 31. 56° 28′ S, 27° 21′ W. 102–0 m. Gear **N 100 B**.

St. WS 537. 25–26. i. 31. 56° 10′ S, 25° 35′ W. 67–0 m. Gear **N 70 B**.

St. WS 541. 28. i. 31. 57° 51½′ S, 19° 51½′ W. 102–0 m. Gear **N 100 B**.

St. WS 544. 29. i. 31. 60° 59′ S, 17° 50′ W. 146–0 m. Gear **N 100 B**.

St. WS 545. 30. i. 31. 61° 51′ S, 17° 15′ W. 124–0 m. Gear **N 100 B**.

St. WS 547. 30. i. 31. 62° 40′ S, 17° 02′ W. 154–0 m. Gear **N 100 B**.

St. WS 548. 31. i. 31. 64° 07′ S, 15° 38′ W. 106–0 m. Gear **N 100 B**.

St. WS 549. 31. i. 31. 65° 17′ S, 15° 33′ W. 128–0 m. Gear **N 100 B**.

St. WS 550. 1. ii. 31. 66° 51½′ S, 15° 24′ W. 121–0 m. Gear **N 70 B**.

St. WS 551. 1. ii. 31. 68° 17½′ S, 14° 26½′ W. 121–0 m. Gear **N 70 B, N 100 B**.

St. WS 552. 2. ii. 31. 68° 53′ S, 13° 03′ W to 68° 50′ S, 13° 03′ W. (Depth not recorded on label.) Gear **N 100 B**.

St. WS 555. 6. ii. 31. 60° 27′ S, 19° 36′ W. 174–0 m. Gear **N 100 B**.

St. WS 564. 21. ii. 31. Moltke Harbour, South Georgia. Shore collection.

St. WS 576. 17. iv. 31. 51° 35′ S, 57° 49′ 45″ W. 34–24 m. Gear **OTC**. Bottom: sand.

St. WS 582. 30. iv. 31. 53° 42′ 30″ S, 70° 55′ W. 12 m. Gear **NH**.

St. WS 583. 2. v. 31. 53° 39′ S, 70° 54′ 30″ W. 14–78 m. Gear **BTS**. Bottom: sand and stones.

St. WS 648. 22. vi. 31. 15° 19′ 30″ S, 75° 13′ W. 111–0 m. Gear **N 100 B**.

St. WS 742. 5. ix. 31. 38° 22′ S, 73° 41′ W. 35 m. Gear **BTS**.

St. WS 748. 16. ix. 31. 53° 41′ 30″ S, 70° 55′ W. 300 (–0) m. Gear **BNR**.

St. WS 750. 18. ix. 31. 52° 12′ S, 67° 19′ W. 95 (–0) m. Gear **BNR**.

St. WS 752. 19–20. ix. 31. 51° 20′ S, 63° 17′ W. 160 (–0) m. Gear **BNR**.

St. WS 755. 21. ix. 31. 51° 39′ S, 57° 39′ W. 75 (–0) m. Gear **BNR**.

St. WS 756. 10. x. 31. 50° 54′ 39″ S, 59° 58′ W. 118–90 m. Gear **OTC**. Bottom: gravel, mud and sand.

St. WS 758. 12. x. 31. 48° 31′ S, 61° 19′ W. 112 (–0) m. Gear **BNR**. Bottom: rock.

St. WS 762. 16. x. 31. 43° 50′ S, 65° 01′ 51″ W. 67–65 m. Gear **OTC, N 7–T**. Bottom: sand and mud

St. WS 763. 16. x. 31. 44° 14′ S, 63° 28′ W. 87–82 m. Gear **OTC**. Bottom: mud and sand.

St. WS 764. 17. x. 31. 44° 38′ 15″ S, 61° 58′ 30″ W to 44° 38′ 45″ S, 61° 49′ 30″ W. 106 m., gear **DC**; 110–104 m., gear **OTC**. Bottom: fine green sand.

St. WS 765. 17. x. 31. 45° 07′ S, 60° 28′ 15″ W. 113–118 m. Gear **OTC**. Bottom: mud and sand.

St. WS 766. 18–19. x. 31. 45° 13′ S, 59° 56′ 30″ W. 545 m. Gear **NCS–T**. Bottom: fine dark green sand.

St. WS 770. 21. x. 31. 46° 03′ S, 66° 34′ W. 95 (–0) m. Gear **BNR**. Bottom: brown-grey clay.

St. WS 771. 29. x. 31. 42° 41′ 45″ S, 60° 31′ W. 90 m. Gear **DC, NCS–T, N 7–T**. Bottom: dark green sand.

St. WS 772. 30. x. 31. 45° 13′ 22″ S, 60° 00′ 15″ W. 309–153 m. Gear **NCS–T, N 7–T, N 4–T**.

St. WS 773. 31 x. 31. 47° 28′ S, 60° 51′ W. 291 m., gear **DC**; 291–298 m., gear **OTC**. Bottom: green sand and mud.

St. WS 774. 1. xi. 31. 47° 08′ S, 62° 02′ W. 139 m. Gear **DC**. Bottom: dark green sand and mud.

St. WS 776. 3. xi. 31. 46° 18′ 15″ S, 65° 02′ 15″ W. 110–99 m. Gear **OTC, DC**. Bottom: green mud and sand.

St. WS 777. 3. xi. 31. 45° 56′ S, 66° 24′ W. 98–99 m. Gear **OTC**. Bottom: mud and sand.

St. WS 781. 6. xi. 31. 50° 30′ S, 58° 50′ W. 148 m. Gear **NCS–T, OTC**. Bottom: dark green sand and mud.

St. WS 782. 4. xii. 31. 50° 29′ 15″ S, 58° 23′ 45″ W. 141 m. Gear **DC**. 50° 27′ 45″ S, 58° 29′ 45″ W. 141–146 m. Gear **OTC**. Bottom: green sand.

St. WS 783. 5. xii. 31. 50° 02′ 45″ S, 60° 10′ W. 155 m. Gear **DC**. 50° 02′ 45″ S, 60° 14′ W. 155–159 m. Gear **OTC**. Bottom: rock, mud and sand.

St. WS 784. 5. xii. 31. 49° 47′ 45″ S, 61° 05′ W. 170–164 m. Gear **N 7–T**. Bottom: dark green sand.

St. WS 785. 6. xii. 31. 49° 23′ 45″ S, 62° 41′ 15″ W. 150–146 m. Gear **OTC, N 7–T**. Bottom: dark green sand.

St. WS 786. 7. xii. 31. 49° 07′ S, 63° 55′ W. 133 m. Gear **DC**. Bottom: dark sand.

St. WS 787. 7. xii. 31. 48° 44′ S, 65° 24′ 30″ W. 106–110 m. Gear **OTC**. Bottom: coarse brown sand.

St. WS 788. 13. xii. 31. 45° 07′ S, 64° 54′ W. 82–88 m. Gear **OTC**. Bottom: grey mud and sand.

St. WS 795. 18. xii. 31. 46° 14′ S, 60° 24′ W. 157–161 m. Gear **OTC**. Bottom: sand.

St. WS 796. 19. xii. 31. 47° 53′ 30″ S, 63° 32′ 30″ W. 106–113 m. Gear **OTC**. Bottom: coarse brown sand.

St. WS 797. 19. xii. 31. 47° 47′ 43″ S, 64° 07′ 30″ W. 111–114 m. Gear **OTC**. Bottom: stones.

St. WS 798. 20. xii. 31. 47° 32′ S, 65° 02′ W. 49–66 m. Gear **NCS–T**. Bottom: pebbles, shell and sand.

St. WS 801. 22. xii. 31. 48° 26′ 15″ S, 61° 28′ W. 165 m. Gear **OTC, NCS–T**. Bottom: dark sand.

St. WS 803. 5. i. 32. 50° 33′ 45″ S, 62° 05′ 30″ W. 174–186 m. Gear **OTC**.

St. WS 804. 6. i. 32. 50° 22′ 45″ S, 62° 49′ W. 150–143 m. Gear **OTC**. 50° 21′ 15″ S, 62° 53′ W. 143–150 m. Gear **N 7–T**. Bottom: gravel and sand.

St. WS 805. 6. i. 32. 50° 10′ 15″ S, 63° 29′ W. 148 m. Gear **NCS–T**. Bottom: coarse dark sand.

St. WS 807. 7. i. 32. 49° 50′ 30″ S, 65° 03′ W. 125–126 m. Gear **OTC**. Bottom: dark sand.

St. WS 808. 8. i. 32. 49° 40′ 15″ S, 65° 42′ W. 110–107 m. Gear **NCS–T**. Bottom: brown-green sand.

St. WS 809. 8. i. 32. 49° 28′ 15″ S, 66° 29′ W. 107–104 m. Gear NCS–T. Bottom: brown sand.

St. WS 811. 12. i. 32. 51° 24′ 30″ S, 67° 53′ W. 96–98 m. Gear OTC. Bottom: sand and stones.

St. WS 813. 13. i. 32. 51° 35′ 15″ S, 67° 16′ 15″ W. 106–102 m. Gear OTC. Bottom: dark sand.

St. WS 814. 13. i. 32. 51° 45′ 15″ S, 66° 40′ W. 111–118 m. Gear OTC. Bottom: coarse dark sand.

St. WS 824. 19. i. 32. 52° 29′ 15″ S, 58° 27′ 15″ W. 146–137 m. Gear OTC. Bottom: green sand and shell.

St. WS 825. 28–29. i. 32. 50° 50′ S, 57° 15′ 15″ W. 135–144 m. Gear OTC. Bottom: sand, mud and shells.

St. WS 832. 1. ii. 32. 50° 49′ S, 67° 55′ W. 75–0 m. Gear N 70 B.

St. WS 834. 2. ii. 32. 52° 57′ 45″ S, 68° 08′ 15″ W. 27–38 m. Gear OTC, NCS–T. Bottom: dark brown and grey stones, mud and sand.

St. WS 836. 3. ii. 32. 53° 05′ 30″ S, 67° 38′ W. 64 m. Gear BTS.

St. WS 837. 3. ii. 32. 52° 49′ 15″ S, 66° 28′ W. 98–102 m. Gear OTC, N 7–T, N 4–T, NCS–T. Bottom: coarse dark green sand and pebbles.

St. WS 839. 5. ii. 32. 53° 30′ 15″ S, 63° 29′ W. 403–434 m. Gear N 4–T. Bottom: fine sand and mud.

St. WS 840. 6. ii. 32. 53° 52′ S, 61° 49′ 15″ W. 368–463 m. Gear OTC, N 4–T. Bottom: green-grey sand.

St. WS 841. 6. ii. 32. 54° 11′ 45″ S, 60° 21′ 30″ W. 109–120 m. Gear OTC. Bottom: stones and shell.

St. WS 847. 9. ii. 32. 50° 15′ 45″ S, 67° 57′ W. 51–56 m. Gear OTC. 50° 18′ 45″ S, 67° 44′ 00″ W. 56–84 m. Gear NCS–T.

St. WS 848. 10. ii. 32. 50° 37′ 30″ S, 66° 24′ W. 115–117 m. Gear OTC. Bottom: dark green sand.

St. WS 849. 10. ii. 32. 50° 56′ 45″ S, 64° 58′ W. 137–137 m. Gear OTC. Bottom: dark sand.

St. WS 851. 11. ii. 32. 51° 39′ 30″ S, 62° 01′ 15″ W. 221–197 m. Gear OTC, N 7–T. Bottom: stones.

St. WS 852. 21. iii. 32. 44° 12′ 30″ S, 64° 13′ W. 86–88 m. Gear BTS.

St. WS 856. 23. iii. 32. 46° 35′ S, 64° 11′ W. 104–104 m. Gear BTS.

St. WS 863. 28. iii. 32. 49° 05′ S, 64° 09′ W. 121–117 m. Gear BTS.

St. WS 866. 29. iii. 32. 50° 37′ 45″ S, 64° 15′ W. 137–144 m. Gear OTC.

St. WS 867. 30. iii. 32. 51° 10′ S, 64° 15′ 30″ W. 150–147 m. Gear BTS.

St. WS 869. 31. iii. 32. 52° 15′ 30″ S, 64° 13′ 45″ W. 187 (–0) m. Gear BNR.

St. WS 871. 1. iv. 32. 53° 16′ S, 64° 12′ W. 336–341 m. Gear BTS.

St. WS 877. 4. iv. 32. 52° 35′ 30″ S, 61° 04′ W. 350 (–0) m. Gear BNR.

MARINE BIOLOGICAL STATION, SOUTH GEORGIA

St. MS 15. 17. ii. 25. East Cumberland Bay, South Georgia, 3 miles SW of Merton Rock to $2\frac{1}{4}$ miles NNW of Dartmouth Point. 110 m. Gear DS.

St. MS 62. 24. ii. 26. East Cumberland Bay, South Georgia, $\frac{1}{2}$ cable E to $3\frac{3}{4}$ cables S of Hobart Rock. 31 m. Gear BTS.

St. MS 64. 24. ii. 26. 1·8 miles SE × S of King Edward Point Light, East Cumberland Bay, South Georgia. 7–15 m. Gear DS.

St. MS 65. 28. ii. 26. East Cumberland Bay, South Georgia. 1·6 miles SE of Hobart Rock to 1 cable N of Dartmouth Point. 39 m. Gear BTS.

St. MS 68. 2. iii. 26. East Cumberland Bay, South Georgia. 1·7 miles S ½ E to 8½ cables SE × E of Sappho Point. 220–247 m. Gear NRL.

LIST OF SPECIES

Family AMPHINOMIDAE

Euphrosyne arctia, Johnson
Euphrosyne maorica, Augener
Chloeia inermis, Quatrefages

Family APHRODITIDAE

Aphrodite longirostris, Kinberg
Aphrodite talpa, Quatrefages
Laetmatonice producta, Grube

Family POLYNOIDAE

Harmothoë magellanica (McIntosh)
Harmothoë exanthema (Grube)
Harmothoë exanthema, Grube, var. ***bergströmi***, var.nov.
Harmothoë brevipalpa, Bergström
Harmothoë brevipalpa, Bergström, var. ***ciliata***, var.nov.
Harmothoë benthophila, Ehlers
Harmothoë ernesti, Augener
Harmothoë spinosa, Kinberg
Harmothoë spinosa, Kinberg, var. *lagiscoides*, Willey
Harmothoë (*Barrukia*) *cristata* (Willey)
Eunoë anderssoni (Bergström)
Eulagisca corrientis, McIntosh
Hermadion magalhaensi, Kinberg
Polynoë antarctica, Kinberg
Lepidametria gigas (Johnson)
Hololepida australis, n.sp.
Halosydna patagonica, Kinberg
Antinoë antarctica (Bergström)
Euphionella patagonica, gen. et sp.nov.
Macellicephala mirabilis, McIntosh
Eucranta mollis (McIntosh)
Eucranta villosa, Malmgren, var. ***notialis***, var. nov.
Polyeunoa laevis, McIntosh

Family SIGALIONIDAE

Sigalion ovigerum, Monro
Leanira quatrefagesi, Kinberg
Psammolyce semiglabra, n.sp.
Sthenelais limicola (Ehlers), var. ***novae-zealandiae*** var.nov.

Family PHYLLODOCIDAE

Phyllodoce longipes, Kinberg
Phyllodoce patagonica (Kinberg)
Phyllodoce madeirensis, Langerhans
Phyllodoce bowersi, Benham
Eulalia magalhaensis, Kinberg
Eulalia picta, Kinberg
Genetyllis polyphylla (Ehlers)
Eteone sculpta, Ehlers
Lopadorhynchus krohnii (Claparède), var. *simplex*, Monro
Lopadorhynchus uncinatus, Fauvel
Pelagobia longicirrata, Greeff
Mystides notialis, Ehlers

Family ALCIOPIDAE

Alciopa cantrainii (Delle Chiaje)
Vanadis antarctica (McIntosh)
Vanadis formosa, Claparède
Vanadis crystallina, Greeff
Vanadis violacea, Apstein
Greeffia oahuensis, McIntosh
Callizona angelini (Kinberg)
Callizonella bongraini (Gravier)
Torrea candida (Delle Chiaje)

Family TOMOPTERIDAE

Tomopteris carpenteri, Quatrefages
Tomopteris planktonis, Apstein
Tomopteris cavallii, Rosa
Tomopteris septentrionalis, Quatrefages

Family TYPHLOSCOLECIDAE

Sagitella lobifera, Ehlers
Travisiopsis benhami, n.sp.

Family SYLLIDAE

Syllis prolixa, Ehlers
Syllis sclerolaema, Ehlers
Syllis brachychaeta, Schmarda
Trypanosyllis gigantea (McIntosh)
Trypanosyllis taeniaeformis (Haswell)
Pionosyllis comosa, Gravier
Pionosyllis nutrix, n.sp.
Eusyllis kerguelensis, McIntosh
Amblyosyllis granosa, Ehlers
Autolytus charcoti, Gravier
Autolytus simplex, Ehlers
Polybostrichus sp.

Family NEREIDAE

Nereis (Eunereis) hardyi, Monro
Nereis cricognatha, Ehlers
Nereis callaoana, Grube
Nereis jacksoni, Kinberg
Nereis eugeniae (Kinberg)
Nereis kerguelensis, McIntosh
Platynereis magalhaensis, Kinberg
Leptonereis loxechini (Kinberg)

Family NEPHTHYDIDAE

Nephthys dibranchis, Grube
Nephthys serratifolia, Ehlers
Nephthys macrura, Schmarda
Nephthys squamosa, Ehlers

Family GLYCERIDAE

Glycera capitata, Oersted
Goniada eximia, Ehlers
Glycinde armata (Kinberg)

Family SPHAERODORIDAE

Ephesia antarctica, McIntosh

Family EUNICIDAE

Eunice frauenfeldi, Grube
Eunice pennata (O. F. Müller)
Eunice australis, Quatrefages
Diopatra punctifera, Ehlers
Diopatra sp.
Diopatra neapolitana, Delle Chiaje
Rhamphobrachium ehlersi, Monro
Onuphis conchylega, Sars
Onuphis iridescens (Johnson)
Onuphis dorsalis (Ehlers)
Onuphis aucklandensis, Augener
Hyalinoecia tubicola (O. F. Müller)
Lumbrinereis magalhaensis, Kinberg
Lumbrinereis heteropoda, Marenzeller
Lumbrinereis cingulata, Ehlers
Lumbrinereis near *impatiens*, Claparède
Augeneria tentaculata, Monro
Ninoë falklandica, n.sp.
Drilonereis filum (Claparède)

Family ARICIIDAE

Scoloplos marginatus (Ehlers)
Haploscoloplos kerguelensis (McIntosh)

Family CIRRATULIDAE

Cirratulus cirratus (O. F. Müller)
Cirratulus antarcticus, Monro
Cirratulus filiformis, Keferstein

Family SPIONIDAE

Polydora natrix, Söderström

Family CHAETOPTERIDAE

Chaetopterus variopedatus (Renier)

Family CHLORHAEMIDAE

Stylarioides kerguelarum (Grube)
Stylarioides swakopianus, Augener
Flabelligera affinis, M. Sars

Family OPHELIIDAE

Travisia kerguelensis, McIntosh
Ammotrypane scaphigera, Ehlers
Ammotrypane breviata, Ehlers
Ophelia bipartita, n.sp.

Family MALDANIDAE

Clymene (*Isocirrus*) *yungi* (Gravier)
Axiothella antarctica, Monro
Maldane sarsi, Malmgren, var. *antarctica*, Arwidsson
Lumbriclymenella robusta, Arwidsson
Asychis amphiglypta (Ehlers)

Family SABELLARIIDAE

Sabellaria (*Phragmatopoma*) *antipoda*, Augener
Sabellaria (*Phragmatopoma*) *moerchi* (Kinberg)
Idanthyrsus armatus, Kinberg

Family AMPHICTENIDAE

Pectinaria ehlersi, Hessle

Family AMPHARETIDAE

Ampharete kerguelensis, McIntosh
Amage sculpta, Ehlers
Phyllocomus crocea, Grube
Neosabellides elongatus (Ehlers)
Amphicteis philippinarum, Grube
Amphicteis gunneri (Sars), var. *antarctica*, Hessle

Family TEREBELLIDAE

Amphitrite kerguelensis, McIntosh
Amphitrite affinis, Malmgren, var. ***antarctica***, var.nov.
Leaena abranchiata, Malmgren, var. *antarctica*, McIntosh
Leaena collaris, Hessle
Nicolea chilensis (Schmarda)
Polymnia nebulosa (Montagu)
Neoleprea streptochaeta (Ehlers)
Loimia medusa, Savigny
Pista mirabilis, McIntosh
Thelepus setosus (Quatrefages)
Thelepus cincinnatus (Fabricius)
Streblosoma bairdi (Malmgren), var. ***antarctica***, var.nov.
Polycirrus kerguelensis (McIntosh)
Polycirrus hesslei, Monro
Hauchiella tribullata (McIntosh)
Octobranchus antarcticus, n.sp.

Family SABELLIDAE

Sabella oatesiana, Benham
Potamilla antarctica (Kinberg)
Oridia limbata (Ehlers)
Chone duneri, Malmgren
Euchone pallida, Ehlers

Family SERPULIDAE

Serpula vermicularis, Linnaeus
Vermiliopsis notialis, Monro
Spirobranchus latiscapus (Marenzeller)

INCERTAE SEDIS

Loandalia aberrans, gen. et sp.nov.

The total number of species, exclusive of a *Polybostrichus* and a *Diopatra* to which I have not given a name, is 159. There are two new genera, a Polynoid *Euphionella*, and *Loandalia*, a curious tropical West African form which I am unable to assign to any of the known families. The number of new species is eight and there are six new varieties.

GEOGRAPHICAL DISTRIBUTION

BENTHIC SPECIES

Although the present collection was obtained from positions as widely separated as off Peru, West Africa and New Zealand, much the greater part of the benthic material came from two areas, the South Georgia area which for the present purposes includes South Georgia, South Sandwich Islands, South Orkneys, South Shetlands, Palmer Archipelago, Bellingshausen Sea, and the Falkland Islands area which includes the Falkland Islands and between the Falkland Islands and South America.

The colder water Polychaete fauna of the South Georgia area is not the same as that round the Falklands, although there is considerable overlapping.

The benthic species fall into the following groups according to the areas in which they were found:

I. SOUTH GEORGIA, SOUTH SANDWICH ISLANDS, BELLINGSHAUSEN SEA

Laetmatonice producta
Harmothoë magellanica
Harmothoë spinosa
Harmothoë (*Barrukia*) *cristata*
Eunoë anderssoni
Antinoë antarctica
Macellicephala mirabilis
Eucranta mollis
Polyeunoa laevis
Phyllodoce patagonica
Genetyllis polyphylla
Syllis brachychaeta
Pionosyllis nutrix
Eusyllis kerguelensis
Amblyosyllis granosa
Autolytus charcoti
Nereis kerguelensis
Leptonereis loxechini
Nephthys macrura
Glycera capitata
Eunice pennata
Diopatra sp.
Rhamphobrachium ehlersi
Onuphis conchylega
Lumbrinereis magalhaensis
Augeneria tentaculata
Scoloplos marginatus
Haploscoloplos kerguelensis
Cirratulus cirratus
Cirratulus antarcticus
Cirratulus filiformis
Polydora natrix
Stylarioides kerguelarum
Ammotrypane breviata
Clymene (*Isocirrus*) *yungi*
Axiothella antarctica
Maldane sarsi var. *antarctica*
Asychis amphiglypta
Ampharete kerguelensis
Amage sculpta
Phyllocomus crocea
Neosabellides elongatus
Amphicteis gunneri, var. *antarctica*
Amphitrite kerguelensis
Leaena abranchiata, var. *antarctica*
Leaena collaris
Pista mirabilis
Thelepus cincinnatus
Streblosoma bairdi var. *antarctica*
Polycirrus kerguelensis
Hauchiella tribullata
Octobranchus antarcticus
Potamilla antarctica
Oridia limbata
Euchone pallida
Serpula vermicularis
Vermiliopsis notialis

The following additional species were recorded from this area in my previous (1930) Discovery Report:

Paramphinome australis
Euphrosyne arctia
Aphrodite alta
Hermadion ferox
Hermadion magalhaensi
Eulagisca corrientis
Eunoë opalina
Harmothoë crosetensis
Harmothoë kerguelensis
Harmothoë curviseta
Antinoë setobarba
Eteone sculpta
Eteone aurantiaca
Eteone rubella
Phyllodoce bowersi
Phyllodoce longipes
Austrophyllum charcoti
Eulalia magalhaensis
Eulalia anomalochaeta
Eulalia picta
Pionosyllis comosa
Pionosyllis maxima
Trypanosyllis gigantea
Autolytus gibber
Grubea clavata
Syllis prolixa
Syllis brachycola
Nereis typhla
Platynereis magalhaensis
Ephesia antarctica
Onuphis notialis
Thelepus setosus
Lysilla loveni, var. *macintoshi*
Lumbrinereis antarctica
Scoloplos mawsoni
Pygospio dubia
Nerine sp.
Paraonis gracilis
Phyllochaetopterus sp.
Tharyx epitoca
Tharyx sp.
Flabelligera affinis
Flabelligera pennigera
Flabelligera mundata
Brada villosa
Brada mammillata
Scalibregma inflatum
Capitella capitata
Notomastus latericeus
Notomastus lineatus?
Travisia kerguelensis
Travisia kerguelensis, var. *gravieri*
Kesun abyssorum
Rhodine intermedia
Lumbriclymenella robusta
Clymene kerguelensis
Nicomache sp.
Sternaspis scutata
Melinna cristata
Terebella ehlersi
Pista corrientis
Neoleprea streptochaeta
Lanicides vayssieri
Artacama proboscidea
Terebellides minutus
Terebellides longicaudatus

The total number of benthic species recorded by me from the South Georgia area is 123.

II. OFF THE FALKLAND ISLANDS AND BETWEEN THE FALKLAND ISLANDS AND SOUTH AMERICA

Euphrosyne arctia
Aphrodite longirostris
Harmothoë magellanica
Harmothoë brevipalpa
Harmothoë ernesti
Harmothoë exanthema
Harmothoë spinosa
Harmothoë spinosa var. *lagiscoides*
Eulagisca corrientis
Hermadion magalhaensi
Polynoë antarctica
Hololepida australis
Halosydna patagonica
Antinoë antarctica
Euphionella patagonica
Eucranta mollis
Eucranta villosa var. *notialis*
Polyeunoa laevis
Leanira quatrefagesi
Phyllodoce longipes
Phyllodoce patagonica
Phyllodoce bowersi

Eulalia magalhaensis
Eulalia picta
Eteone sculpta
Mystides notialis
Syllis prolixa
Syllis sclerolaema
Trypanosyllis gigantea
Eusyllis kerguelensis
Autolytus charcoti
Autolytus simplex
Nereis hardyi
Nereis eugeniae
Nereis kerguelensis
Platynereis magalhaensis
Leptonereis loxechini
Nephthys serratifolia
Nephthys macrura
Nephthys squamosa
Glycera capitata
Goniada eximia
Glycinde armata
Ephesia antarctica
Eunice frauenfeldi
Eunice pennata
Onuphis conchylega
Onuphis iridescens
Onuphis dorsalis
Lumbrinereis magalhaensis
Lumbrinereis cingulata
Lumbrinereis near *impatiens*
Augeneria tentaculata
Ninoë falklandica
Drilonereis filum
Haploscoloplos kerguelensis
Cirratulus cirratus
Cirratulus antarcticus
Chaetopterus variopedatus
Flabelligera affinis
Travisia kerguelensis
Ammotrypane scaphigera
Ammotrypane breviata
Lumbriclymenella robusta
Asychis amphiglypta
Sabellaria (*Phragmatopoma*) *moerchi*
Idanthyrsus armatus
Pectinaria ehlersi
Phyllocomus crocea
Amphicteis gunneri var. *antarctica*
Amphitrite kerguelensis
Amphitrite affinis var. *antarctica*
Nicolea chilensis
Polymnia nebulosa
Pista mirabilis
Thelepus setosus
Thelepus cincinnatus
Sabella oatesiana
Potamilla antarctica
Serpula vermicularis

The following additional benthic species were recorded from this area in my previous (1930) Discovery Report:

Syllis brachycola
Syllis variegata
Lumbrinereis tetraura
Aricia michaelseni
Travisia olens
Axiothella antarctica
Clymenella minor
Pista corrientis
Neoleprea streptochaeta
Polycirrus kerguelensis
Polycirrus hamiltoni
Polycirrus hesslei
Bispira magalhaensis
Salmacina dysteri, var. *falklandica*

The total number of species recorded by me from this area is 94.

There are forty-nine species common to both the South Georgia and the Falkland Islands areas, and these constitute 40 per cent of the total number of the species from the South Georgia area and 52 per cent of the species from the Falkland Islands area

III. STRAIT OF MAGELLAN

Harmothoë exanthema
Harmothoë brevipalpa, var. *ciliata*
Harmothoë spinosa
Polynoë antarctica
Lepidametria gigas
Antinoë antarctica
Nereis eugeniae
Chaetopterus variopedatus
Amphitrite affinis, var. *antarctica*
Neoleprea streptochaeta
Thelepus setosus
Polycirrus hesslei
Potamilla antarctica
Serpula vermicularis

IV. BOUVET ISLAND

Harmothoë spinosa
Harmothoë spinosa, var. *lagiscoides*
Harmothoë (Barrukia) cristata
Lumbrinereis magalhaensis
Nephthys macrura

V. GOUGH ISLAND

Harmothoë brevipalpa
Genetyllis polyphylla
Nereis callaoana
Serpula vermicularis

The following additional species were recorded from this area in my previous (1930) Discovery Report:

Syllis brachycola
Chaetopterus variopedatus
Serpula loveni

VI. OFF WEST AND SOUTH-WEST AFRICA

Diopatra punctifera
Diopatra neapolitana
Lumbrinereis heteropoda
Stylarioides swakopianus
Loandalia aberrans

The following additional species were recorded from this area in my previous (1930) Discovery Report:

Hermodice carunculata var. *didymobranchiata*
Eurythoë complanata
Chloeia viridis
Notopygos megalops
Malmgrenia micropoides
Antinoë epitoca
Eupanthalis tubifex
Polyodontes mortenseni
Euthalanessa dendrolepis
Leanira incisa
Phyllodoce oculata
Eulalia viridis
Leocrates diplognathus
Syllis variegata
Ceratonereis vittata
Nephthys lyrochaeta
Glycera tesselata
Goniada congoensis
Eunice siciliensis
Eunice vittata
Eunice longicirrata
Nicidion edentulum
Lumbrinereis africana
Lumbrinereis coccinea
Drilonereis filum
Staurocephalus rubrovittatus
Prionospio africana
Chaetopterus variopedatus
Phyllochaetopterus socialis
Cirratulus afer
Pycnoderma congoense
Maldane decorata
Owenia fusiformis
Sternaspis scutata, var. *africana*
Amphicteis gunneri, var. *japonica*
Loimia montagui
Hypsicomus torquatus
Vermiliopsis glandigerus
Vermiliopsis richardi, var. *fauveli*

VII. OFF CHILE

Ophelia bipartita
Thelepus setosus

VIII. OFF PERU

Chone duneri

IX. OFF NEW ZEALAND

Euphrosyne maorica
Aphrodite talpa
Chloeia inermis
Sigalion ovigerum
Psammolyce semiglabra
Sthenelais limicola, var. *novae-zealandiae*
Phyllodoce madeirensis
Trypanosyllis taeniaeformis
Pionosyllis comosa
Amblyosyllis granosa
Nereis cricognatha
Nereis jacksoni
Nephthys dibranchis
Eunice australis
Onuphis aucklandensis
Hyalinoecia tubicola
Sabellaria (*Phragmatopoma*) *antipoda*
Amphicteis philippinarum
Nicolea chilensis
Spirobranchus latiscapus

PELAGIC SPECIES

The following list gives a rough indication of the localities and the minimum and maximum depths at which the pelagic species were obtained:

Harmothoë benthophila. South of Cape Verde Island; 236–0 m.

Lopadorhynchus krohnii, var. *simplex*. South of Cape Verde Island; 236–0 m.

Lopadorhynchus uncinatus. East of La Plata; 246–0 m.

Pelagobia longicirrata. South Georgia; 174–0 m. and 1000–750 m.

Alciopa cantrainii. Off Pernambuco; 182–0 m.

Vanadis antarctica. South Georgia, Bouvet Island, Burdwood Bank; 0–5 m. and 1150–1400 m.

Vanadis formosa. Off Cape Verde Island, South Africa, St Paul Rocks, Rio Grande and La Plata; 101–0 m. and 242–0 m.

Vanadis crystallina. South of Pernambuco and off Bahia; 208–0 m. and 216–0 m.

Vanadis violacea. Off South Africa; 84–0 m. and 550–350 m.

Greeffia oahuensis. Off South Africa; 550–350 m.

Callizona angelini. Off South Africa; 1200–0 m.

Callizonella bongraini. Off South Georgia; 174–0 m.

Torrea candida. East of La Plata; 246–0 m.

Tomopteris carpenteri. Off South Georgia and Bouvet Island; 0–5 m. and 550–250 m.

Tomopteris planktonis. Off Pernambuco, north of Rio de Janeiro, east of La Plata; 182–0 m. and 249–0 m.

Tomopteris cavallii. North-east of Bouvet Island; 170–0 m.

Tomopteris septentrionalis. Off St Helena, South Africa, Bouvet Island, South Georgia, Bellingshausen Sea, north of Falkland Islands, off Pernambuco and La Plata; 73–0 m. and 265–150 m.

Sagitella lobifera. Off South Georgia and between South Georgia and Gough Island; 1150–1400 m. and 1500–1600 m.

Travisiopsis benhami. South Georgia and Bellingshausen Sea; 97–0 m. and 1000–750 m.

Loimia medusa juv. Off South Africa; 106–0 m. and 350–0 m.

SYSTEMATIC ACCOUNT

As in the descriptive part of this report I have made no diagnoses of the families, I give a key, which with slight modifications is that of Fauvel and Gravely.

1. Head usually well developed. All segments of the body alike except those near the mouth and the terminal segment, or pygidium **2**

— Body often divided into several distinct regions. Head small, either not markedly developed or profoundly modified. Feet almost always simple, the ventral rami being often in the form of transverse ridges (tori) or pinnules bearing hooks or uncini. Branchiae generally limited to a definite region **16**

2. Elytra on a certain number of feet, the rest bearing cirri 3
— No elytra 6
3. Compound bristles present ... ... SIGALIONIDAE
— No compound bristles 4
4. Never more than one segment bearing a dorsal cirrus intercalated between two elytrigerous segments. Thread glands present in the feet ... ... POLYODONTIDAE
— In the hinder region of the body either all segments carry dorsal cirri or there are at least two cirrigerous segments intercalated between two elytrigerous segments (except in *Lepidastheniella*). No thread glands 5
5. Eyes stalked, rarely sessile. A single tentacle. Facial tubercle conspicuous ... ... APHRODITIDAE
— Eyes sessile. Three tentacles (except in *Macellicephala*, *Bylgia* and *Iphione*). Facial tubercle absent or rudimentary ... ... POLYNOIDAE
6. A fan-shaped group of broad flattened bristles (paleae) on all segments ... CHRYSOPETALIDAE
Dorsal paleae absent 7
7. Prostomium with two divergent tentacles and flanked by long cirri inclosing acicula. Feet biramous without cirri or bristles... ... ... TOMOPTERIDAE
— Prostomium without tentacles. Feet uniramous. Bristles present 8
— Prostomium with tentacles. Feet biramous 10
8. Prostomium distinct, conical. Foliaceous dorsal and ventral cirri. A few acicular bristles ... ... TYPHLOSCOLECIDAE
— Prostomium indistinct 9
9. Body papillated and bearing in addition transverse rows of large spherical capsules ... ... SPHAERODORIDAE
— No such papillation. Cirri globular ... ... PISIONIDAE
10. Prostomium small. Five tentacles. Caruncle usually present. Gills well developed. Pharynx unarmed ... ... AMPHINOMIDAE
— Prostomium large... 11
11. Pharyngeal armature complex. Upper jaws composed of a number of denticulated plates ... ... EUNICIDAE
— Pharyngeal armature simple or absent. Tentacles not more than three 12
— Tentacles more than three 14
12. Palps simple. Pharynx armed with a single tooth or a crown of denticles, and followed by a barrel-shaped muscular gizzard. Feet uniramous ... ... SYLLIDAE
— Palps biarticulate, sometimes absent. No gizzard. Pharynx armed or unarmed 13
13. Dorsal cirri of moderate length, not moniliform. Pharynx with a pair of toothed jaws and almost always with numerous small paragnaths. Feet usually biramous ... ... NEREIDAE
— Dorsal cirri long, moniliform. Pharynx cylindrical, unarmed or armed only with stylets (except in *Magalia*). Feet biramous and sesquiramous ... ... HESIONIDAE
14. Prostomium conical, annulated, ending in four small tentacles. Pharynx papillated and armed with at least four teeth. Feet biramous ... ... GLYCERIDAE
— Prostomium more or less rectangular with four small tentacles. Feet biramous, with lamellae and a sickle-shaped gill between the rami. Pharynx usually with a pair of jaws and rows of papillae. Bristles simple ... ... NEPHTHYDIDAE
— Feet with foliaceous cirri, without sickle-shaped gill, usually uniramous 15
15. A pair of enormous globular eyes at the sides of the head ... ... ALCIOPIDAE
— Eyes small, normal ... ... PHYLLODOCIDAE
16. Body divided into distinct regions 23
— Body not divided into distinct regions 17
17. Segments numerous. Without anal branchiae and ventral shield 18

— Body short, stout. Segments few. Filiform anal branchiae and a large ventral shield bordered with stiff bristles ... ... STERNASPIDIDAE

18. Palps long, tentacle-like 19

— No tentacle-like palps 22

19. Two long tentacular palps on prostomium 20

— One or more pairs of palps inserted on the anterior segments. Branchiae simple, filiform, inserted above the feet. Capillary and usually acicular bristles. Prostomium conical without processes... ... ... CIRRATULIDAE

20. Two palps and two groups of branchiae retractile into a buccal funnel. Chaetae of first feet prolonged forwards to form a cephalic cage. Body thickly papillated ... CHLORHAEMIDAE

— Two long grooved palps not retractile into the mouth. No cephalic cage 21

21. Palps without suckers. Pedal lamellae erect. Dorsal branchiae cirriform. Hooded hooks present ... ... SPIONIDAE

— Palps with sucker-like papillae. Without branchiae. Prostomium spoon-shaped ... ... MAGELONIDAE

— Anterior cirri flask-shaped or frilled. Lateral branchiae filiform. Several kinds of bristle ... ... DISOMIDAE

22. A single median tentacle. Dorsal cirri and foliaceous dorsal branchiae. Capillary bristles and hooded hooks ... ... PARAONIDAE

— Prostomium with or without two short tentacles. Parapodia more or less conspicuous. Capillary bristles and forked bristles. No hooks ... ... SCALIBREGMIDAE

— Prostomium blunt, without appendages or with a crown of laciniated lobes. No branchiae. Ventral tori with many rows of minute uncini. Tube sandy... ... ... OWENIIDAE

— Prostomium with a keel or bordered cephalic plate. An anal plate or an anal funnel with cirri. No branchiae. Dorsal bristles capillary, ventral sigmoid hooks ... MALDANIDAE

23. A terminal branchial tuft with numerous filaments bearing secondary processes. Prostomium indistinct. Uncini ventral in the thoracic region, dorsal in the abdominal region. Tube membraneous or calcareous 32

— Without terminal branchial tuft 24

24. Large flattened chaetae (paleae) forming an operculum closing the tube 31

— Without opercular bristles 25

25. Prostomium conical or blunt, without processes. Branchiae on many segments 28

— Prostomium more or less distinct. One pair of tentacle-like palps or numerous tentacular filaments 26

26. Prostomium with or without two small tentacles. Two long grooved palps. Two to three markedly dissimilar regions, the anterior short with uniramous feet bearing special chaetae in 4th chaetiger. Posterior notopods erect. Uncini pectinate ... ... CHAETOPTERIDAE

— Without tentacles. A cephalic veil and numerous tentacular filaments. Ventral tori with pectinate uncini 27

27. Tentacular cirri retractile into the mouth. Prostomium distinct. Three to four pairs of branchiae inserted on the first segments ... ... AMPHARETIDAE

— Tentacular cirri not retractile. Prostomium indistinct. Branchiae arborescent or rarely subulate, inserted on the first segments. Sometimes absent... ... ... TEREBELLIDAE

28. With uncinigerous tori 30

— Without uncinigerous tori 29

29. Serrated capillary bristles and acicular hooks. Feet and branchiae conspicuous and erect on the back in the abdominal region ... ... ARICIIDAE

— Capillary bristles only. Feet without lobes. Branchiae lateral, ligulate. Prostomium pointed; conical ... ... OPHELIIDAE

30. Prostomium blunt. Anterior region abranchiate: middle with dorsal, arborescent, non-retractile branchiae: often an achaetous and abranchiate caudal region ... ARENICOLIDAE

— Prostomium conical. Anterior region abranchiate; posterior region with or without simple branchiae; or the branchiae may be branched and retractile into lateral pouches. In the abdominal region, dorsal and ventral tori with sigmoid hooks ... ... CAPITELLIDAE

31. An operculum of an anterior row of large golden paleae. Caudal region very small and foliaceous, with hooks at the base. Two pairs of anterior branchiae. Tube of sand, conical, free ... ... AMPHICTENIDAE

— Two large, opercular stalks bearing a crown of paleae. A narrow achaetous and abranchiate caudal region. Branchiae dorsal and numerous. Fixed, sandy tubes, often in masses ... ... SABELLARIIDAE

32. Without operculum and without thoracic membrane. Tube membraneous or mucous ... ... SABELLIDAE

— Usually with an operculum. Thoracic membrane present. Tube calcareous SERPULIDAE

Family AMPHINOMIDAE

Notopodial bristles in transverse rows across the back ... ... *Euphrosyne*
Notopodial bristles lateral ... ... *Chloeia*

Genus Euphrosyne, Savigny

Body oval and segments few. The prostomium which bends over the front end of the body is partly dorsal and partly ventral. Caruncle with three parallel longitudinal lobes. An unpaired tentacle. Lateral tentacles on the ventral surface. Notopodial bristles in transverse rows across the back. Branchiae ramified and similarly disposed in transverse rows of trunks behind the dorsal bristles. Paired dorsal cirri on each side.

Five pairs of branchial trunks per segment ... ... *Euphrosyne arctia*
Six pairs of branchial trunks per segment ... ... *Euphrosyne maorica*

Euphrosyne arctia, Johnson.

Monro, 1930, p. 34, fig. 4 *a–e*.

OCCURRENCE. St. WS 228 (9); WS 231 (2); WS 246 (4); WS 871 (3).

SPECIFIC CHARACTERS. Length about 11 mm. Number of chaetigers between 17 and 21. Mouth reaches to anterior border of 5th chaetiger. Caruncle high and superficially divided into three longitudinal lobes. It reaches back to the 6th chaetiger. Branchiae begin on the 1st chaetiger and are arranged in transverse rows of five trunks on each side. These trunks usually have four branches and end in small pointed tips. The lower of the two dorsal cirri lies between the 2nd and 3rd most dorsal branchial trunks. The dorsal bristles consist of (1) smooth bifid bristles, (2) ringent bristles, (3) a few bristles apparently intermediate between the "ringents" and the smooth "bifids". The ventral bristles are simple bifids of two sizes.

REMARKS. Neither in this nor in the earlier Discovery collections (Monro, 1930) was an example of this species obtained above the 100-m. line.

Euphrosyne maorica, Augener (Fig. 1).

Augener, 1924, p. 259, fig. 1 *a–d*.

OCCURRENCE. St. 935, New Zealand (1).

SPECIFIC CHARACTERS. A small species with a length of about 10 mm. for 25 chaetigers. The present specimen measures 5 mm. by 2 mm. at the widest part for 21 chaetigers. There are two pairs of eyes, one ventral just in front of the buccal lobes and one dorsal on the prostomium. The caruncle reaches to the 6th chaetiger and the median tentacle is about one-third of its length. The gills begin on the first chaetiger. In a normal segment there are six branchial trunks on each side. Each trunk is very richly branched and the tufts end in narrow unexpanded tips. The lower of the two dorsal cirri lies between the 4th and 5th most dorsal branchial trunks. The dorsal bristles consist of "ringent" bristles (Fig. 1) and smooth bifid bristles. The ventral bristles are smooth bifids of two sizes.

Augener could not in his specimens see any serrations on the short arm of the dorsal ringent bristles. In this specimen they are distinct. Moreover, Augener gives the position of the lower dorsal cirrus as between the 2nd and 3rd most dorsal branchia. I find it between the 4th and 5th, and this agrees with Augener's figure.

Fig. 1. *Euphrosyne maorica.* Ringent bristle.

Genus Chloeia, Savigny

Body oval. Caruncle a long plaited crest with marginal folds. Branchiae pinnate; dorsal cirri single; anus terminal. All bristles usually more or less bifurcated.

Chloeia inermis, Quatrefages.

Benham, 1916A, p. 390, figs. 6–11.
Augener, 1924, p. 258.

OCCURRENCE. St. 939, New Zealand (1 juv.).

SPECIFIC CHARACTERS. There is no colour pattern, and except for the purple median tentacle and dorsal cirri the body in spirit is more or less without colour. The gills begin on the 5th chaetiger. The chaetae show no trace of serrations. Both in the dorsal and ventral bundles they may be (*a*) perfectly smooth, (*b*) may exhibit a minute obsolescent spur. The ventral bristles are thinner than the dorsal, especially those in the middle of the neuropod which are long, hair-like and extremely fine and also have an incipient spur.

The present specimen is a very young example of the species and measures 8 mm. by 3 mm. at the widest part for 23 chaetigers. Up to the middle of the body dorsal bristles of the two types already described are found, and in addition there are a few bristles with small but complete spurs, but in the hinder region the dorsal bristles appear all to be smooth. In the neuropod some of the ventral bristles of the first few chaetigers have an obsolescent spur; otherwise they are smooth. The long, slender, capillary type of ventral bristle is not present behind about the 10th chaetiger.

Family APHRODITIDAE

Dorsal bristles smooth ... ... *Aphrodite*
Dorsal bristles harpoon-shaped... ... ... *Laetmatonice*

Genus Aphrodite, Linnaeus

A thick dorsal felting covers the elytra. Dorsal bristles of two kinds: (1) protective spines usually projecting through the dorsal felting, (2) very long and slender bristles. Ventral bristles stout and with slightly curved tips. They are arranged in three tiers. Eyes, when present, sessile.

Dorsal bristles stout, needle-like, projecting above the dorsal felting. Median tentacle very long ... ... *Aphrodite longirostris*
Dorsal bristles slender, not projecting above the dorsal felting. Median tentacle short ... ... *Aphrodite talpa*

Aphrodite longirostris, Kinberg (Fig. 2 *a*, *b*).

Kinberg, 1857, p. 4, pl. i, fig. 3 *b–h*.

Occurrence. St. WS 798 (2).

Description. This species has been elaborately figured by Kinberg, who nevertheless fails to convey its characteristic appearance. The palisade of long dark brown

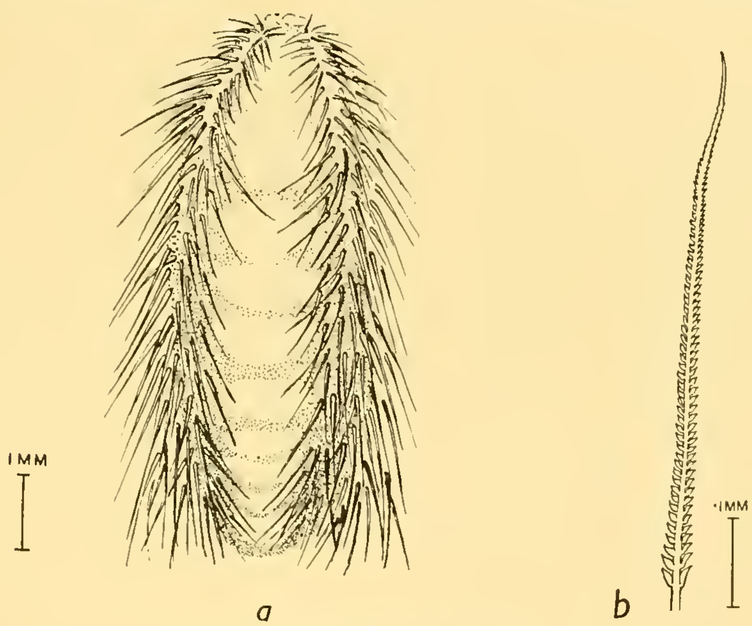

Fig. 2. *Aphrodite longirostris*.
a. Dorsal view. *b*. Lower pinnate bristle, second foot.

needle-like spines (Fig. 2 *a*) projecting upwards and backwards through the dorsal felting but not meeting across the back, is unlike that of any other *Aphrodite* that I have seen. The dorsal spines and the ventral bristles are dark brown and the dorsal felting is greenish grey. The dorsal capillary bristles are covered with mud, but when freed from this show a slight iridescence. The larger specimen measures 75 mm. by 31 mm. at the widest part for about 35 chaetigers. The shape of the body is like that of an

A. aculeata but rather wider and deeper relatively to the length. Except that I see no eyes, Kinberg's figure (3 *B*) of the head well represents that of these specimens. The prostomium is rounded and devoid of ocular peduncles. There is a very long and slender median tentacle without a distal enlargement: it is about three times as long as the head and two-thirds of the length of the palps. Its slightly stouter tentaculophore is about as long as the head. There is a large, laterally compressed, papillated facial tubercle. The tentacular cirri are short, being only about two-thirds of the length of the median tentacle. The tentacular segment, as usual, carries only notopodial bristles.

The elytra are figured by Kinberg: their surface is covered with a network of very fine lines and they carry a few minute papillae. The dorsal felting is very solid and compact and has a thickness of about 1 mm. The dorsal spines are very long, relatively twice as long as those of *A. aculeata*, and sharp, and show about 18 mm. of length above the dorsal felting. They make a formidable palisade above the back but leave uncovered a narrow path down the middle. The silky, capillary dorsal bristles appear to be quite smooth, and are thickly covered with mud.

The ventral bristles of the first two feet (2nd and 3rd chaetigers) are of three types: (1) the upper are stout dark brown bristles with slightly curved ends; (2) the middle are rather long bristles with most of the shaft smooth but pinnate towards the slender tip; (3) the lower are rather like the middle bristles, but much smaller and with strongly developed pinnae over most of their length (Fig. 2 *b*). In the middle feet the ventral bristles consist of smooth, strong chaetae with slightly hooked ends. They are not bearded.

In the hinder neuropods there are the usual denticulated bristles similar to those figured by me (Monro, 1930, fig. 5 *f–i*) for *A. alta*. In the middle feet the ventral cirri reach to the end of the foot, in the posterior feet they are longer.

Remarks. This species is characterized by the long median tentacle and by the palisade of dorsal spines. *A. australis* has prominent, long dorsal bristles, but they are flattened, relatively delicate structures, very different from the sharp spines of this species.

Of the species of *Aphrodite* from high southern latitudes *A. echidna*, Quatrefages of McIntosh, has a very short median tentacle and short sharp spines projecting through the dorsal felting; *A. alta*, Kinberg, has dorsal bristles with slender hooked tips which do not penetrate the dorsal felting.

Aphrodite talpa, Quatrefages (Fig. 3).

Quatrefages, 1865, 1, p. 196, pl. vi, figs. 2–4.
Fauvel, 1925, p. 140, fig. 4 *a–l*.
Non Ehlers, *nec* Benham, Augener, Fauvel (1917).

Occurrence. St. 936, New Zealand (3); 939, New Zealand (1).

Specific characters. This species is characterized by the slenderness of the dorsal bristles which are entangled for most of their length in the dorsal felting, but have their ends lying obliquely along the back. Moreover, the narrowing of the hinder end into a kind of tail, which is apparent in most members of the genus to some extent, is here

carried very much further. The anterior four-fifths of the body is broadly oval, but the hinder fifth consists of a narrow caudal prolongation (Fig. 3).

The largest specimen measures 50 mm. by 25 mm. at the widest part for 40 chaetigers and the smallest measures 17 mm. by 7 mm. for 35 chaetigers. There is a very small median tentacle, half the length of the head. There is a pair of rounded ocular areas each of which carries two minute black dots, which I take to be eyes.

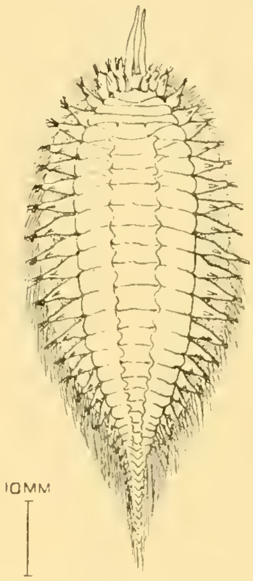

Fig. 3. *Aphrodite talpa*. Ventral view.

The dorsal bristles are long, rather slender, smooth and with delicate curved tips. They are covered with mud and lie obliquely along the back and with the naked eye are almost impossible to distinguish from the rest of the felting. This separates the present species from the much commoner *A. australis*, Baird, in which the dorsal bristles are much stouter, more abundant and more prominent.

The extent to which the dorsal bristles are entangled with the felting is variable. They may be almost covered by it, or they may lie for the most part loosely above it.

The ventral bristles are arranged in three rows in the usual manner. Towards the end they taper suddenly into fine, sharp-looking points, and the narrow tip is usually covered with hairs. In the first and second feet there are the usual hastate bristles and twisted bipinnate bristles and in the hinder region there are found hastate, denticulated, bipinnate and spinous bristles as in other species.

REMARKS. I am satisfied that these specimens do not belong to *A. australis* and they agree well enough with Fauvel's redescription of the type of *A. talpa*, Quatrefages. Fauvel, however, makes no mention of the caudal prolongation which is a noticeable feature in the present specimens. They are very close to the specimen from the Palmer Archipelago attributed by me (1930, p. 37) to *A. alta*, Kinberg. They can be distinguished by the presence of the tail, which in *A. alta* is very little developed.

Genus **Laetmatonice**, Kinberg

A median tentacle, beneath which is a large papillated facial tubercle. No lateral tentacles. Eyes on short peduncles. 15–20 pairs of elytra. Dorsal felting either absent or slightly developed. Dorsal bristles harpoon-shaped. Ventral bristles bifurcated with a row of stiff hairs at the tip.

Laetmatonice producta, Grube.

Gravier, 1911, p. 80.
Fauvel, 1923, p. 38.
Monro, 1930, p. 39.
Augener, 1932 *a*, p. 13.

OCCURRENCE. St. 363 (3); 474 (10).

SPECIFIC CHARACTERS. Dorsal felting absent. May attain a size of 18 cm. by $3\frac{1}{2}$ cm. with about 50 chaetigers. 18–20 pairs of elytra. Harpoon-shaped bristles with five to six teeth. Slender bipinnate ventral bristles confined to the first four chaetigers. There may be as many as 50 stiff hairs below the tip of the bifurcated ventral bristles.

L. filicornis is a much smaller species with only 15 pairs of elytra. Both McIntosh and Fauvel state that the slender ventral bipinnate bristles of the anterior region extend to the first five chaetigers. Working, it is true, with rather poor material I have myself failed to find any behind the 4th chaetiger.

Family POLYNOIDAE

1. With no lateral tentacles... ... ... *Macellicephala*
— With lateral tentacles 2
2. 12 pairs of elytra ... ... *Euphionella*
— 15 pairs of elytra 3
— 18 pairs of elytra 8
— Elytra numerous. Body long, vermiform 9
3. Body short, about 40 segments, more or less completely covered by elytra 4
— Body short, between 40 and 50 segments, not covered by elytra in hinder region ... ... *Hermadion*
— Body long and vermiform, elytra confined to anterior region ... ... *Polynoë*
4. Lateral tentacles inserted subterminally. A facial tubercle present ... ... *Eulagisca*
— Lateral tentacles inserted ventrally. No facial tubercle 5
5. Upper ventral bristles slender, capillary 6
— Upper ventral bristles moderately stout 7
6. Upper ventral bristles capillary with a long spinous region and a hair-like tip ... *Antinoë*
— Upper ventral bristles ending in a minutely bifid tip ... ... *Eucranta*
7. Ventral ramus having either bidentate bristles only, or both bidentate and unidentate bristles ... ... *Harmothoë*
— Ventral ramus having unidentate bristles only ... ... *Eunoë*
8. Lateral tentacles inserted subterminally. Dorsal bristles slender and heavily pectinated ... ... *Halosydna*
9. With both a facial tubercle and an occipital flap ... ... *Hololepida*
— With neither facial tubercle nor occipital flap 10
10. Lateral tentacles inserted terminally ... ... *Lepidametria*
— Lateral tentacles inserted ventrally ... ... *Polyeunoa*

Genus Harmothoë, Kinberg

Lateral tentacles inserted ventrally. Prostomium with lateral peaks. Fifteen pairs of elytra more or less covering the whole back. Dorsal chaetae stouter than the ventral which are usually bidentate, but may be both bidentate and unidentate.

1. Dorsal bristles with bearded tips ... Subgenus *Barrukia*. *Harmothoë* (*Barrukia*) *cristata*
— Dorsal bristles without bearded tips 2
2. Dorsal bristles of two distinct types ... ... *Harmothoë benthophila*
— Dorsal bristles of one type 3
3. Ventral bristles usually all bidentate 4
— Ventral bristles partly bidentate and partly unidentate 7
4. Elytral tubercles few, confined to a small area near scar of attachment ... ... *Harmothoë magellanica*

— Elytral tubercles numerous, spread over most of the surface 5
5. Smaller elytral tubercles bollard-shaped ... ... *Harmothoë ernesti*
— Smaller elytral tubercles hook-shaped 6
6. Hinder border of elytra usually carrying a few large conical vesicles. About 37 segments ... ... *Harmothoë spinosa*
— Hinder border of elytra usually carrying long curved spines. About 40 segments ... ... *Harmothoë spinosa*, var. *lagiscoides*
7. Elytra with large vesicles 8
— Elytra without large vesicles 9
8. Elytral vesicles pear-shaped with an apical papilla ... ... *Harmothoë exanthema*
— Elytral vesicles globular, without an apical papilla ... *Harmothoë exanthema* var. *bergströmi*
9. Elytra with only a few cilia at the hinder border ... ... *Harmothoë brevipalpa*
— Elytra ciliated over most of the surface ... ... *Harmothoë brevipalpa*, var. *ciliata*

Harmothoë magellanica (McIntosh).

Lagisca magellanica, McIntosh, 1885, p. 82, pl. xiii, fig. 5; pl. xviii, figs. 3–4; pl. viiA, figs. 1–2.
Harmothoë magellanica, Bergström, 1916, p. 280, pl. iv, figs. 1–3.
Monro, 1930, p. 54.
Augener, 1932*a*, p. 18.

Occurrence. St. 123 (2); 156 (1 juv.); WS 27 (4); WS 225 (4); WS 228 (1); WS 239 (4); WS 244 (5); WS 246 (3); WS 249 (1); WS 764 (1); WS 776 (1); WS 803 (1); WS 825 (5); WS 840 (1); WS 852 (10); WS 871 (numerous).

Specific characters. There may be about 15 segments behind the last pair of elytra. There are often small dark spots on the elytra which are smooth except for a small patch of minute tubercles near the umbilicus.

The dorsal bristles are stout, numerous and lightly striated; the ventral are long and clearly bidentate, and the upper ventral bristles have the toothing continued much farther down the shaft than the rest.

Remarks. As the hinder end of the body is left uncovered by the elytra in this species, it would perhaps be preferable to refer it to *Lagisca* rather than to *Harmothoë*.

Harmothoë exanthema (Grube).

Bergström, 1916, p. 287, pl. iii, fig. 5.

Occurrence. St. 53 (3); WS 582 (1); WS 762 (2); Puerto Bueno, Sarmiento Channel, 13 m. (2 juv.).

Specific characters. About 40 chaetigers. Anterior pair of eyes at the sides of the head. The elytra do not quite cover the hinder extremity. They are provided with small, conical tubercles and also at their hinder border with a few large pear-shaped vesicles surmounted by a long papilla. The dorsal bristles are strongly pectinated and the ventral are both unidentate and bidentate.

This species is allied to *H. ernesti*, Augener, and seems to live in shallow water.

Harmothoë exanthema (Grube), var. bergströmi, var.nov. (Fig. 4 *a–c*).

Occurrence. St. WS 221 (1); WS 583 (1); WS 834 (5).

Varietal characters. The pyriform tubercles with an apical papilla are absent and the elytra (Fig. 4 *a*) carry in addition to numerous small acuminate tubercles (Fig. 4 *b*)

a number of gigantic soft globular vesicles (Fig. 4 *c*) without an apical papilla. As in the stem-form the ventral bristles are both bidentate and unidentate, the former being more numerous in the middle of the bundle.

The specimens from St WS 834 present a remarkable appearance, for the whole surface of about the hinder third of the scales is a mass of gigantic round vesicles with a granular structure, each attached to the scale by a narrow base. The specimen from St. WS 221 has much fewer and smaller vesicles, and the only remaining scale on the specimen from St. WS 583 has a few large vesicles. All these structures are at once separable from the much smaller, harder, pyriform and papillated tubercles in the stem-form.

The largest of the present specimens measures 30 mm. by 5 mm. without the feet for 40 chaetigers.

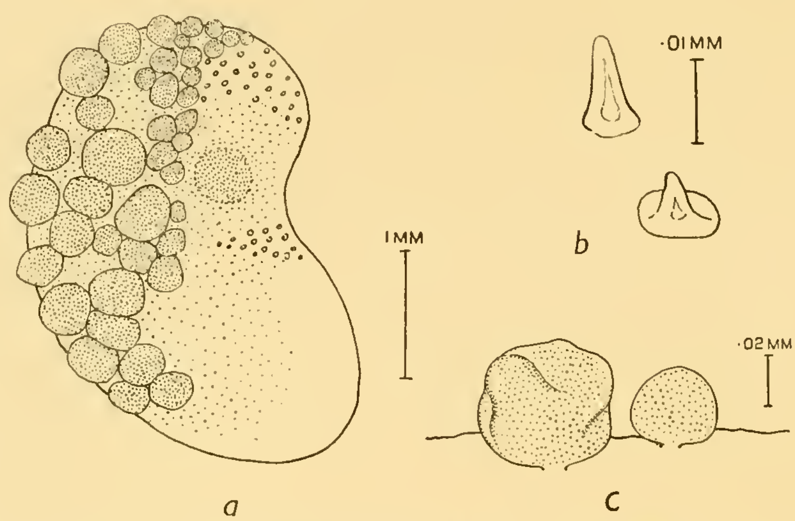

Fig. 4. *Harmothoë exanthema*, var. *bergströmi*.
a. Elytron. *b*. Acuminate tubercles. *c*. Globular vesicles.

Remarks. Augener, who has seen the type, states that *Polynoë vesiculosa*, Grube, from the Magellan region is the same as *Harmothoë exanthema*, and as I regard the present examples as distinctly separable from the latter species I have established a new variety. I rather suspect that Ehlers (1897, p. 14 and 1901, p. 42) had before him examples both of this form and of *exanthema*, and included them both under the name *vesiculosa*.

Harmothoë brevipalpa, Bergström (Fig. 5).

Bergström, 1916, p. 277, pl. ii, fig. 1; pl. iv, figs. 4–7.
Augener, 1932*b*, p. 100.
Harmothoë (*Evarnella*) *impar*, var. *notialis*, Monro, 1930, p. 58, fig. 13 *a–d*.

Occurrence. St. 399 (6); WS 229 (3).

Specific characters. A small species measuring about 15 mm. by 2 mm. without the feet for 34 chaetigers. There is a typical harmothoid head with the anterior pair of

eyes in the middle of the lateral surfaces of the prostomium. The palps are normal, being about twice as long as the head (Fig. 5). The elytra have a few small papillae at the external border and are rather sparsely dotted with small conical tubercles.

The dorsal bristles are numerous and strongly pectinated. The upper ventral bristles are elongate, slender, bidentate and with a long spinous region: more ventrally they become shorter and more expanded distally. The middle ventral chaetae are bidentate. The bristles at the base of the neuropod are unidentate and with a short spinous region.

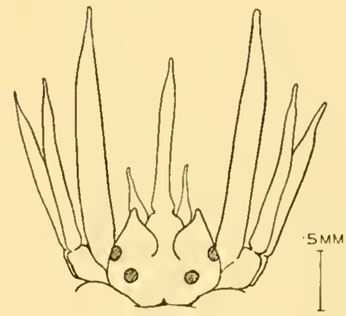

Fig. 5. *Harmothoë brevipalpa.* Head from above.

Remarks. Augener has rightly pointed out that the new variety of *H. impar* described by me in 1930 differs from Bergström's *H. brevipalpa* only in the absence of the great reduction in size of the palps which Bergström found in his specimen and treated as an important specific differential. Augener further holds the view that the reduction of the palps in Bergström's specimen was an accidental condition due to loss followed by regeneration. As a number of specimens have been found since Bergström's original description which agree with his type except in the matter of the palps, I accept Augener's conclusion. My *H. impar* var. *notialis* therefore becomes a synonym of *H. brevipalpa*.

Harmothoë brevipalpa, Bergström, var. ciliata, var.nov. (Fig. 6).

Occurrence. St. WS 583 (1).

Varietal characters. The variety differs from the stem-form in that the outer and posterior borders of the elytra are furnished with a fringe of long cilia. Moreover, cilia are not confined to the marginal fringe but are found over a great part of the surface of the scale (Fig. 6), especially in the area adjoining the fringe. In other respects the variety and the stem-form are indistinguishable.

Remarks. This variety is based on a single complete specimen measuring 13 mm. by 3 mm. for 35 chaetigers.

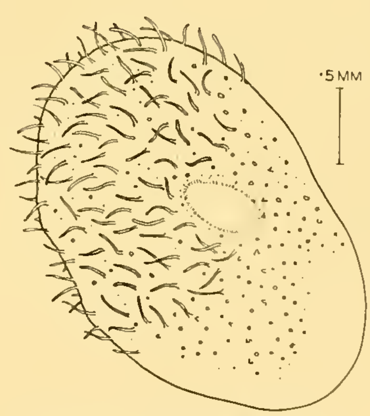

Fig. 6. *Harmothoë brevipalpa,* var. *ciliata.* Elytron.

Harmothoë benthophila, Ehlers.

Fauvel, 1923, p. 68, figs. 24 *h–o*.

Occurrence. St. 702 (1).

Specific characters. Prostomium bilobed without frontal peaks. Median tentacle longer than the palps, lateral tentacles shorter than the head. Ten to eleven pairs of elytra covering the back; they are large, soft, transparent and carry a few papillae. Dorsal bristles of two sorts: (1) short and curved with rows of scales and tips ending in two blunt points, (2) very long straight bristles with spirally arranged scales and tips also ending in two blunt points.

The upper ventral bristles are long, slender and spinous with curved bidentate tips; the lower ventral bristles are shorter and broader; they are almost smooth and have bidentate tips. There is a caudal appendage. The present specimen measures 4 mm. by 1 mm. without the feet for about 24 chaetigers.

Harmothoë ernesti, Augener? (Fig. 7 *a–d*).

Augener, 1931, p. 281, fig. 2 *a–f*.

OCCURRENCE. St. WS 811 (1); WS 834 (6).

SPECIFIC CHARACTERS. Body rather elongate for a *Harmothoë*. Number of segments between 35 and 41. An average specimen measures 25 mm. by 3 mm. without the feet. The lateral tentacles are short, about as long as the head, one-third as long as the median tentacle and tentacular cirri, and one-fourth as long as the palps. The anterior pair of eyes is placed in the middle of the head at its lateral edges. The elytra leave the

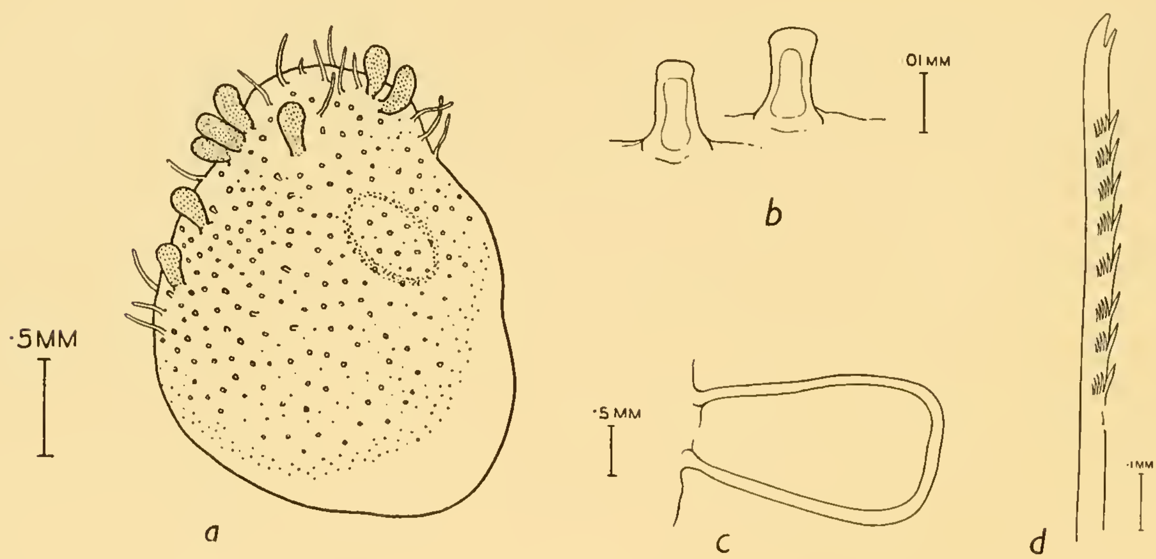

Fig. 7. *Harmothoë ernesti*.
a. Elytron. *c*. Vesicle.
b. Tubercles. *d*. Ventral bristle.

posterior extremity uncovered. They are fringed (Fig. 7 *a*) and carry numerous small bollard-shaped tubercles with thick cuticular caps (Fig. 7 *b*) and a few large egg-shaped or urn-shaped vesicles (Fig. 7 *c*). These large vesicles tend to be situated at the hinder margin of the scales especially in the posterior region of the body. In the front region they are distributed more widely over the surface. The dorsal bristles are stout and strongly pectinated except at the tip, which is smooth. Just above the neuropodial aciculum the apex of the chaeta-sac is produced into a finger-shaped process. The ventral bristles (Fig. 7 *d*) are rather slender, with numerous frills and a bidentate tip. The second tooth lies well below the terminal tooth.

Remarks. I regard these specimens as rather doubtfully belonging to Augener's species from the Abrolhos Bank off Brazil. The elytral vesicles appear to be similar, but in Augener's species they are more numerous. The present specimens are probably southern representatives of *Harmothoë impar*, Johnston.

Harmothoë spinosa, Kinberg.

Ehlers, 1913, p. 438, pl. xxvi, figs. 1–12.
Bergström, 1916, p. 284, pl. ii, figs. 5–6; pl. iii, figs. 1–4.

Occurrence. St. 371 (7); 456 (numerous); WS 27 (3); WS 225 (2); WS 239 (1); WS 244 (4); WS 583 (1); WS 762 (3); WS 764 (1); WS 782 (3); WS 784 (2); WS 801 (2); WS 811 (1); WS 824 (2); WS 825 (5); WS 834 (2); WS 837 (2); WS 867 (4); MS 65 (1).

Specific characters. There are 37 segments. The elytra are mottled with reddish brown and the back and feet are banded to a variable extent with brown markings. There are numerous, minute, conical, acuminate tubercles on the elytra, and in addition the hinder border may be provided with several large, vesicular tubercles. These are often absent. Furthermore, the external edge of the elytra may or may not be furnished with a fringe of cilia. The dorsal bristles may be strongly pectinated or almost smooth. The ventral are toothed and as a rule bidentate. Specimens with unidentate ventral bristles are, however, found, and also intermediate specimens in which one or two faintly bidentate bristles may be seen in neuropods bearing unidentate bristles.

Remarks. Almost the only constant specific character that I can find after examining a large series of this species is the presence of the numerous, minute, conical acuminate tubercles on the elytra. The large haul of specimens from off Bouvet Island yielded a number of examples with unidentate ventral bristles.

Harmothoë spinosa, Kinberg, var. **lagiscoides**, Willey.

Willey, 1902, p. 265.
Gravier, 1911, p. 92, pl. vi, figs. 64–69.
Harmothoë lagiscoides, Bergström, 1916, p. 282, pl. ii, figs. 2–3.
Augener, 1932 *a*, p. 15.

Occurrence. St. 456 (8); WS 764 (6).

Varietal characters. The number of segments is about 40, and the pigmentation is more intense than in *H. spinosa*. A few of the terminal segments are left uncovered by the elytra, and the hinder end is noticeably more tapered than in the stem-form. The hinder border of the elytra is furnished with a few long, acuminate spines.

Remarks. Bergström and Augener have raised Willey's var. *lagiscoides* to specific rank. In my earlier Antarctic report I included it under *H. spinosa*. I have now come to the conclusion that its characters are sufficiently constant to merit at any rate varietal status.

Subgenus **Barrukia**, Bergström

As *Harmothoë*, except that the dorsal bristles mostly have bearded tips.

Harmothoë (Barrukia) cristata (Willey).

Gattyana cristata, Willey, 1902, p. 268, pl. xliv, figs. 1–4.
Barrukia cristata, Bergström, 1916, p. 297, pl. v, figs. 7–9 and 14.

Occurrence. St. 363 (4); 456 (2).

Specific characters. There is a row of median dorsal pads running the whole length of the body. The elytra are papillated and have clavate tubercles with crenate tops. The dorsal bristles mostly have bearded tips and the ventral are unidentate with two short rows of teeth on the shaft.

Remarks. The specimens from St. 363 are distinctive in having in the hinder part of the elytra a patch of relatively gigantic spinous pustules which are variable in shape and size.

Genus Eunoë, Malmgren

As *Harmothoë*, but with unidentate ventral bristles.

Eunoë anderssoni (Bergström).

Harmothoë anderssoni, Bergström, 1916, p. 286, pl. iii, fig. 6; pl. iv, figs. 8–10.
Monro, 1930, p. 57.

Occurrence. St. 123 (3); WS 33 (2); MS 62 (1).

Specific characters. A small species measuring about 10 mm. by 1 mm. without the feet for 34 chaetigers. There is a typical harmothoid head and two pairs of rather large eyes. The anterior pair are on the sides of the head in the middle, and the posterior are dorsal but at the extreme lateral edges. The elytra have both marginal and submarginal papillae and both large and small tubercles with irregular jagged tips. The dorsal bristles are numerous and pectinated: the upper neuropodial bristles are rather elongate and slender with a long spinous region showing scales on the blade as well as a toothed edge. From above downwards the bristles show an increasingly shorter spinous region, and the lower ventral bristles are expanded distally and have a very short spinous region showing a toothed edge only. All the neuropodial bristles are unidentate. This appears to be the normal condition, but in the specimens from St. 123 the two or three uppermost bristles in the ventral bundle show distinct traces of a second tooth.

Genus Eulagisca, McIntosh

The arrangement of the elytra is as in *Harmothoë*. The insertion of the lateral tentacles is terminal or subterminal, not ventral. A large facial tubercle is present. The dorsal bristles are stouter than the ventral and lightly pectinated: the ventral are frilled and unidentate.

Eulagisca corrientis, McIntosh.

McIntosh, 1885, p. 91, pl. xiii, fig. 4; pl. viiA, figs. 3–4.
Monro, 1930, p. 48, fig. 11 *a–e*.
Augener, 1932 *a*, p. 19.

Occurrence. St. WS 246 (1).

Specific characters. This is a large species measuring up to about 80 mm. by 15 mm. without the feet for 36 segments. It is superficially very like a Panthalid. The head is of the lepidonotid type in that the insertion of the lateral tentacles is terminal, but the top of the median ceratophore lies a little above the lateral ceratophores after

the manner of *Halosydna*. All the appendages are hirsute except the palps, which are covered with small papillae. There is a well-developed conical facial tubercle, and behind the head a nuchal flap or gibbosity. The bristles of the tentacular segment are unusually numerous and well developed. The elytra are arranged as in *Harmothoë*, and the pseudo-elytrophores are scarcely less prominent than the elytrophores. The dorsal cirrophores are set very low down on the feet and have a prominent lateral expansion. The dorsal cirri are very long, the tips of the bristles only reaching to about half their length. The bristles are as described for the genus.

REMARKS. I cannot agree with Augener that this species is capable of inclusion under *Harmothoë*. The genus *Eulagisca* is very near to *Allmaniella*, McIntosh, from which it differs in the possession of unidentate instead of bidentate ventral bristles and of a facial tubercle. The latter may prove to be only a specific character.

Genus **Hermadion**, Kinberg

Fifteen pairs of elytra arranged as in *Harmothoë* but leaving the hinder end of the body uncovered. There are about 15 segments behind the last pair of elytra. The lateral tentacles are inserted ventrally, but there are no prostomial peaks. The dorsal bristles are numerous, stout, and either smooth or very lightly pectinated, the ventral bristles are unidentate.

Hermadion magalhaensi, Kinberg.

Fauvel, 1916, p. 423, pl. viii, figs. 10–11, with synonymy.

OCCURRENCE. St. 652 (2); WS 84 (1); WS 576 (1); WS 755 (numerous); WS 841 (2).

SPECIFIC CHARACTERS. The elytra are variably coloured with brown and white markings. They are thickly covered with small tubercles. The dorsal bristles are dark brown, stout, upturned, and either smooth or very lightly pectinated: the ventral are unidentate and with well-developed scales.

Genus **Polynoë**, Savigny

Body long and vermiform, with numerous segments. Fifteen pairs of elytra confined to the anterior region and leaving a large number of hinder segments uncovered. The lateral tentacles are inserted ventrally. The dorsal ramus is much less developed than the ventral. The dorsal bristles are smooth or lightly pectinated; the ventral are frilled and either unidentate or bidentate.

Polynoë antarctica, Kinberg.

Kinberg, 1857, p. 23, pl. x, fig. 58.
Fauvel, 1916, p. 426.
Monro, 1930, p. 53.
Harmothoë antarctica, Bergström, 1916, p. 279.

OCCURRENCE. St. WS 583 (1); WS 755 (5); WS 869 (5).

SPECIFIC CHARACTERS. The elytra are usually punctuated with small dark spots, or they may be bordered with brown. They are quite smooth except for a patch of minute

tubercles near the umbilicus. Prostomial peaks are present. The palps are papillated, and the tentacles and cirri carry a few sparse papillae. The dorsal bristles are few in number (four to six) and either smooth or very lightly pectinated. The ventral bristles are short, rather stout, carry rows of spines and are clearly bidentate.

Genus Lepidametria, Webster

The body is long and vermiform with between 60 and 150 segments and up to 50 pairs of elytra. The lateral tentacles are terminally inserted. The elytra are inserted on segments 2, 4, 5, 7, 9 and on alternate segments up to between the 25th and 30th chaetigers. Behind this the arrangement is irregular. The notopod is represented by an aciculum and sometimes by a few bristles also.

Lepidametria gigas (Johnson) (Fig. 8 *a*, *b*).

Polynoë gigas, Johnson, 1897, p. 172, pl. vii, figs. 33, 42, 42 *a*; pl. viii, figs. 48, 48 *a*, 48 *b*, 49.
Lepidametria gigas, Seidler, 1924, p. 145.

OCCURRENCE. St. WS 583 (1).

SPECIFIC CHARACTERS. The single specimen measures 70 mm. by 8 mm. including the feet for 88 chaetigers. There are 48 pairs of large elytra which completely cover the body. They are mottled with patches of iron grey pigment. The body itself has no colour.

The head corresponds to Johnson's figure. It is broad at the base and the anterior pair of eyes is placed laterally at the widest part. The bases of the tentacles are rather elongate. The tentacles, palps and tentacular cirri all extend about an equal distance beyond the end of the head. The ventral cirrus of the first chaetiger is almost as long as the tentacular cirri. The elytra are quite smooth and correspond to Johnson's figure. According to Johnson the elytra are arranged as in *Halosydna* up to the 33rd chaetiger, i.e. on 2, 4, 5, 7, 9...27, 28, 30, 31, 33; after that on alternate segments up to the 49th chaetiger and then very irregularly. In this specimen the arrangement is a little different. The elytra are inserted on 2, 4, 5, 7, 9...29, 30, and from then onwards on alternate segments to the end of the body except in a few places where this regular arrangement is interrupted by two or three elytra being attached to consecutive segments. I have seen no asymmetrical segments with a cirrus on one side and an elytron on the other.

Fig. 8. *Lepidametria gigas*.
a. Upper bristle, first foot.
b. Lower bristle from first foot.

The notopod is represented by an aciculum and I see no bristles. The neuropod carries a sheaf of stout bristles with frilled and expanded ends. The tips may be either unidentate or bidentate and both types of bristle occur in the same foot, and also inter-

mediate stages in which the second tooth appears to be abortive. In the front region the bristles are predominantly bidentate and in the hinder region unidentate. The first two chaetigers carry special bristles. In the first foot there are in the upper part of the bundle a few moderately stout bristles with frilled ends and long, whip-like slender tips (Fig. 8 *a*). The rest of the bundle consists of delicate barbed bristles (Fig. 8 *b*). In the second foot the bristles are similar to those of the first except that the stout upper bristles are more numerous and the delicate barbed bristles much fewer.

REMARKS. Johnson's Californian specimens measured up to 165 mm. in length, and the elytra did not extend to the hinder extremity. Moreover, the arrangement of the elytra is a little different from that given by Johnson, who also makes no mention of the special bristles in the first two segments. Nevertheless, I believe this specimen to belong to Johnson's species, of which it is probably a young example. The arrangement of the elytra brings it close to my genus *Lepidastheniella* characterized by the presence of elytra on the 2nd, 4th, 5th, 7th, and on every alternate segment to the end of the body.

Ehlers's *L. irregularis* (Ehlers, 1901, p. 54) is very near, but the elytra are relatively much smaller, more rounded and do not overlap. They present a very different appearance from that of the widely overlapping, more or less reniform or oval structures in the present species.

The specimen is stated to have been found as a commensal with a Terebellid which itself occupied an empty Gastropod shell of the genus *Voluta*.

Genus **Hololepida**, Moore

Up to about 120 chaetigers. The head has the lateral tentacles inserted subterminally. There are a large occipital flap or gibbosity and a prominent facial tubercle. The elytra are inserted on segments 2, 4, 5, 7, and on alternate chaetigers up to the 23rd segment: from the 23rd to about the 40th segment they follow an irregular sequence, and from behind about the 40th chaetiger they are found in every segment. The notopodial bristles are fine, smooth capillaries: the upper neuropodial bristles are slenderly lanceolate and delicately denticulated, the lower neuropodial are coarser and have rows of frills and bidentate tips.

Hololepida australis, n.sp. (Fig. 9 *a–h*).

OCCURRENCE. St. WS 246 (1); WS 248 (1); WS 824 (1); WS 825 (1).

DESCRIPTION. In its general aspect this species is more like a Panthalid than a Polynoid. It is very large and striking to the eye. None of the specimens is complete and the largest fragment measures 90 mm. by 8 mm. without the feet and 17 mm. with the feet for only 38 chaetigers. The most complete fragment measures 63 mm. by 12 mm. with the feet for 42 chaetigers. Another specimen is broken into three pieces which together measure 95 mm. by 12 mm. including the feet for 59 chaetigers. These three fragments although all apparently belonging to the same individual do not represent an entire animal. The body is elongate, vermiform and flattened dorso-ventrally. In spirit the dorsum is a bluish grey, the feet and the large bolster-like elytrophores being colourless.

There are traces of reddish brown pigment on the head, tentacles, dorsal cirri and elytra.

The head (Fig. 9 *a*) is bilobed, and each lobe is roughly triangular. The lobes of the prostomium are continued into the ceratophores of the lateral tentacles, but the ceratophore of the median tentacle lies a little above the lateral ceratophores as in *Halosydna*.

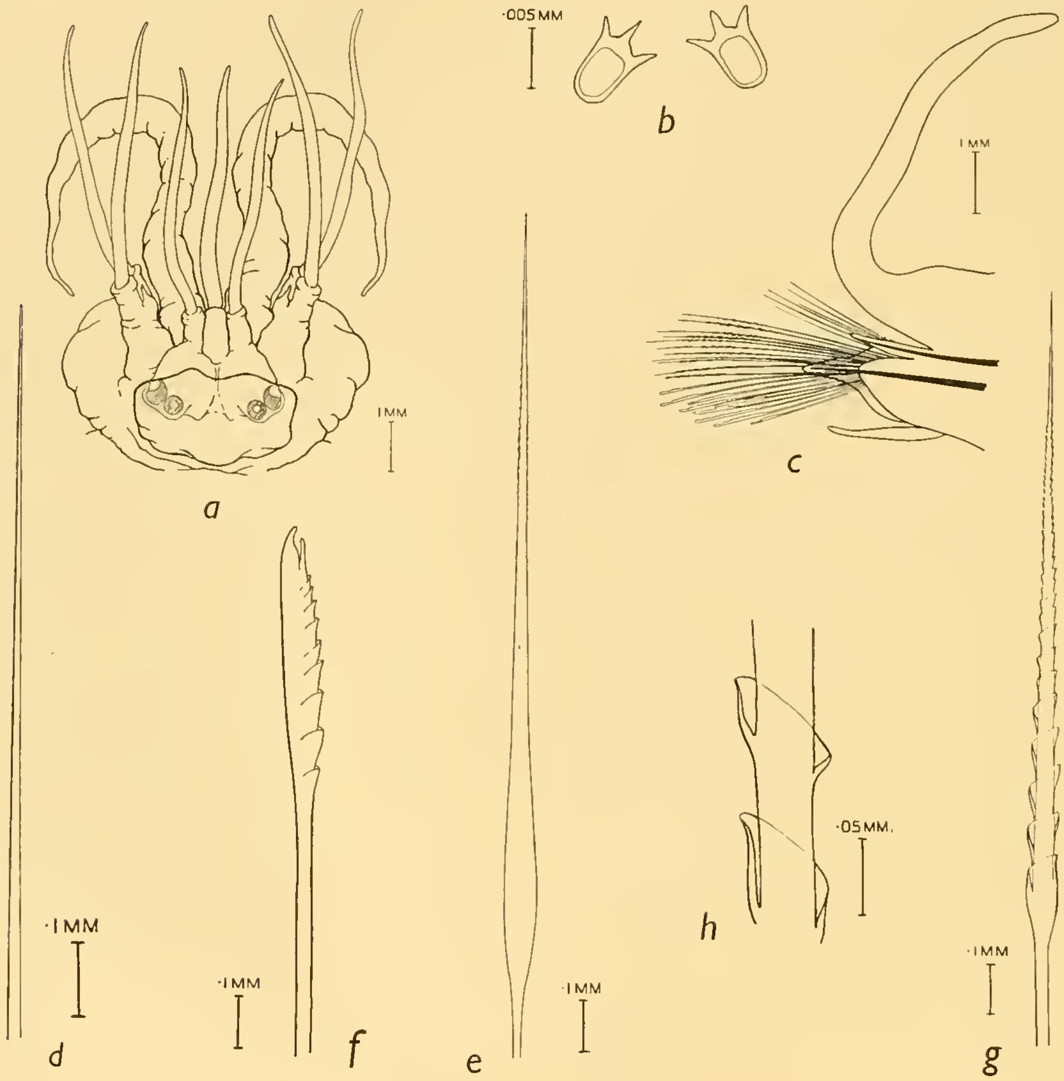

Fig. 9. *Hololepida australis*.

a. Head from above.
b. Elytral tubercles.
c. Middle foot.
d. Dorsal bristle.
e. Uppermost ventral bristle.
f. Bidentate ventral bristle.
g. Intermediate type of ventral bristle.
h. Part of ventral bristle highly magnified.

At the postero-lateral borders of the head are two pairs of enormous contiguous eyes provided with lenses. The palps reach back to the 5th chaetiger, and the three tentacles and the tentacular cirri are all of about the same length, which is approximately two-thirds that of the palps. Tentacles, cirri and palps are smooth. Below the median

ceratophore is a facial tubercle, and the back of the head is covered by a large nuchal flap. The tentacular cirri are carried forward on each side so that they arise a little in front of the head. Between their upper and lower ceratophores and on the inside there is a small cirriform process enclosing an aciculum.

Nearly all the elytra are lost. Such as remain are frayed at the edges and damaged. They appear on the following segments: 2, 4, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 26, 29, 30, 32, 35, 38, 39, 40, 42, 43. The most complete fragment has only 42 chaetigers, so that I cannot follow the arrangement in the more posterior region. I suspect that behind the 42nd segment there are elytra on every segment. At any rate a hinder fragment from St. WS 824 has elytrophores on all the segments. The elytra are large, thick, more or less broadly oval, and have a gelatinous appearance. Under the microscope they have a fibrous texture and are dotted with very minute three-pronged tubercles (Fig. 9 *b*).

The feet (Fig. 9 *c*) are large and triangular. The dorsal ramus is much reduced and is represented by a long projecting process, containing an aciculum, and a small bundle of bristles arising from the anterior face of the neuropod. The ventral ramus is triangular and the anterior lip is produced into a cirriform process inclosing an aciculum. In the notopod the acicular process is postsetal and in the neuropod presetal.

Dorsal bristles are absent from the first two chaetigers. The dorsal cirri are long and extend well beyond the tips of the bristles: the ventral scarcely reach to the end of the foot. From about the 10th chaetiger backwards there is a white, glandular patch surrounding the base of the ventral cirrus. Nephridial papillae are visible from the 6th chaetiger.

The dorsal bristles (Fig. 9 *d*) are long, smooth, very fine capillaries. The ventral bristles are stouter than the dorsal. The uppermost ventral bristles (Fig. 9 *e*) are long, slenderly lanceolate and towards the hair-like apex have faintly denticulated edges. Below these and occupying most of the neuropod both above and below the acicular process there are moderately stout bristles (Fig. 9 *f*) with bidentate tips, and they have along the blade a row of oblique pockets with plain edges. Between these two types of ventral bristles there are one or two bristles more or less intermediate in type (Fig. 9 *g*). Their general shape is like that of the upper lanceolate bristles but they carry rows of pockets (Fig. 9 *h*) like the lower bidentate bristles.

Remarks. I was at first inclined to regard these specimens as capable of inclusion within *H. magna*, Moore, from Alaskan waters, but they show a number of differences which in my opinion justify the establishment of a new species. The arrangement of the elytra in Moore's specimen and mine is similar up to the 32nd segment: Moore gives elytra on 32, 33, 35, 36, 38, 39, 40, 41, etc.: I find them on 32, 35, 38, 39, 40, 42, 43. Moore makes no mention of tubercles on the elytra; in these specimens there are characteristic three-pronged tubercles. Moore states that the two types of ventral bristle are separated in the foot by the aciculum; in these specimens there are numerous bristles of the bidentate type above as well as below the aciculum. Finally Moore states that dorsal bristles are absent from the first three notopods; in these specimens they are absent from the first two notopods.

Genus Halosydna, Kinberg

Body oblong. Lateral tentacles subterminally inserted. Pairs of elytra 18 or 21, covering the terminal segments. Dorsal bristles rather slender and strongly pectinated, ventral with rows of frills below the tip, which may be either unidentate or bidentate.

Halosydna patagonica, Kinberg.

Kinberg, 1857, p. 17, pl. v, fig. 23 *a–h*.
Seidler, 1924, p. 116, with synonymy.

Occurrence. St. WS 762 (2); WS 834 (20); WS 837 (1); WS 847 (1).

Specific characters. Thirty-six segments and eighteen pairs of elytra. The elytra are fringed and covered with small tubercles in addition to which there are a number of large conical vesicles well figured by Kinberg (fig. 23 *H*). The dorsal bristles are slender and heavily pectinated, the ventral are rather stout, bidentate and with frilled ends. The neuropod of the 1st chaetiger carries special bristles, which are delicate and barbed.

Remarks. This species does not apparently penetrate as far south as South Georgia, for it was not represented in the extensive collections from that area made by the 'Discovery' in 1925–7, nor is it reported by Bergström from the collections of the Swedish South Polar Expedition.

Genus Antinoë, Kinberg

Fifteen or sixteen pairs of elytra arranged as in *Harmothoë*. The lateral tentacles are inserted ventrally and prostomial peaks are present. The dorsal bristles are stout and pectinated; the ventral are long and slender with elongated spinous regions and hair-like tips.

Antinoë antarctica (Bergström).

Austrolaenilla antarctica, Bergström, 1916, p. 291, pl. iii, fig. 8; pl. v, figs. 1 and 2.
Antinoë antarctica, Monro, 1930, p. 66, fig. 18.

Occurrence. St. 39 (1); 123 (2); 142 (1); WS 211 (3 juv.); WS 212 (numerous); WS 213 (5); WS 214 (7); WS 229 (numerous fragments); WS 234 (6); WS 236 (numerous fragments); WS 237 (4); WS 244 (5); WS 748 (2); WS 752 (1); WS 758 (1); WS 773 (numerous fragments); WS 784 (1); WS 805 (numerous fragments); WS 839 (2 juv.).

Specific characters. The head is very broad and divided by a median groove. The prostomial peaks are not clearly defined. The eyes are very small and sometimes invisible. The median tentaculophore is very large and all three tentaculophores are reddish brown. The elytra have a variable number of small tubercles and on their external margin a few clavate papillae. There are 15 pairs as in *Harmothoë*. The dorsal bristles are lightly pectinated and the ventral are long, slender, unidentate and end in a bearded or hirsute tip.

Genus Euphionella, gen.nov.

As *Euphione*, McIntosh, *sensu* Seidler (1924, p. 98), but characterized by the presence of pseudo-elytra (*vide* Seidler, 1921, p. 90) and of completely smooth ventral bristles.

The lateral tentacles are terminally inserted. There are 12 pairs of elytra arranged as in *Lepidonotus* and completely covering the body. The segments having a dorsal cirrus are provided with fan-shaped membranes which Seidler has called pseudo-elytra. Ramose branchiae are present from the 3rd chaetiger on the hinder faces of the feet, and small, globular branchial processes are found on the elytrophores and on the corresponding structures in the cirrigerous segments. The dorsal bristles are exceedingly fine barbed capillaries; the ventral are stout, simple and without teeth or ornamentation of any kind.

Genotype: *Physalidonotus lobulatus*, Seidler.

Euphionella patagonica, n.sp. (Fig. 10 *a–l*).

Occurrence. St. WS 212 (1).

Description. The specimen measures 19 mm. by 4 mm. without the feet for 25 chaetigers. In spirit there is no colour. The elytra are inserted on segments 2, 4, 5, 7, 9...21, 23, as in *Lepidonotus*. The head (Fig. 10 *a*) is rectangular, rather longer than broad. The lateral tentacles are terminal. A median groove is only slightly indicated. I see two pairs of rather indistinct, almost contiguous, eyes at the outer and hinder borders of the head. The lateral tentacles are about half as long again as the head and the median tentacle is about three times as long as this. The tentacular cirri are intermediate in length between the lateral and the median tentacles, the dorsal being slightly longer than the ventral. The tentacular segment carries a few bristles. The ventral cirrus of the 1st chaetiger is slender and elongate, being about twice as long as the foot. All these appendages are smooth, and have a slight subterminal dilatation. The palps, on the other hand, which are about one-third as long again as the median tentacle, are heavily papillated.

The elytra (Fig. 10 *b*) are large, leathery, firmly attached and cover the whole body. They are roughly slipper-shaped, and so disposed that the part corresponding to the heel overlaps the part corresponding to the toe of the succeeding scale. The elytrophores are narrowly oval structures with their long axis lying across the body. They are attached to the elytra a little behind the middle point. The elytra are heavily fringed with long cilia. In the first pair the fringe is absent only from the anterior border, and in the remainder the fringe is confined to the outer and hinder edges. In addition to the marginal fringe of cilia there are a number of shorter cylindrical papillae dotted about on the scale itself in the neighbourhood of the marginal fringe. In the region of the umbilicus the elytra show a transverse thickening or hillock caused by the increase of connective tissue between the two layers of cuticle, and on the top of this hillock or crest there are three or four very large conical or capstan-shaped tubercles (Fig. 10 *c*). Besides these there are two further kinds of tubercle. Between the crest and the hinder

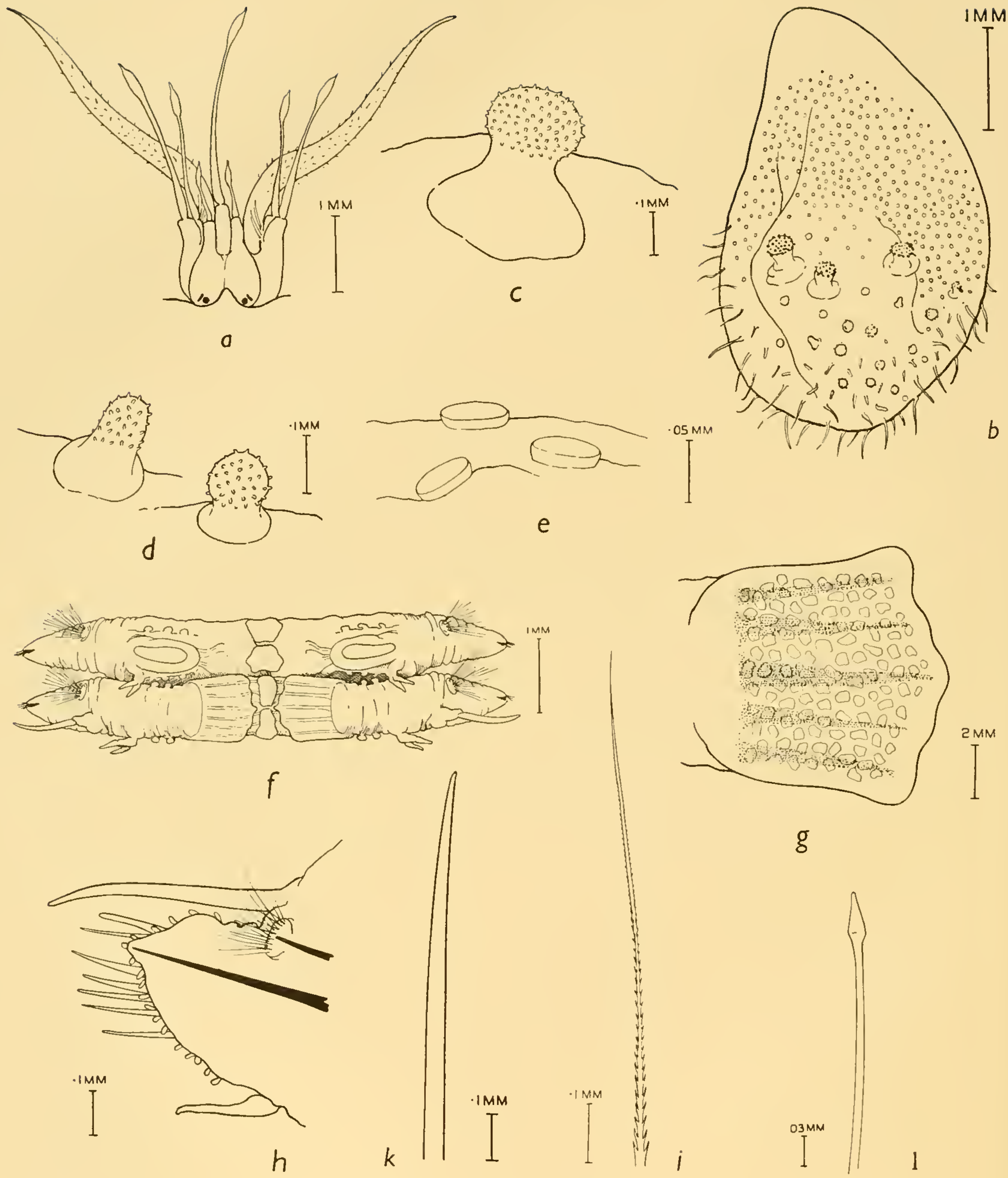

Fig. 10. *Euphionella patagonica.*

a. Head.
b. Elytron.
c. Larger type of echinate tubercle.
d. Smaller type of echinate tubercle.
e. Disk-shaped tubercle.
f. Dorsal surface of two middle segments, showing pseudo-elytra.
g. Pseudo-elytron.
h. Middle foot.
i. Dorsal bristle.
k. Ventral bristle.
l. Lower ventral bristle.

border of the scale there are a few smaller, but still large, roughly capstan-shaped, echinate tubercles (Fig. 10 *d*) and dotted all over the scale there are numerous small disk-shaped tubercles (Fig. 10 *e*). These are sparse in the front region of the scale.

On the back in the median line there is a longitudinal row of small, very soft pads. The 1st chaetiger has a single conical pad. In the 2nd chaetiger the pad shows signs of dividing into two pads lying side by side, for there are two cones arising from a single base. The following four chaetigers have two pairs of pads, one pair behind the other and the members of each pair lying side by side. Behind the sixth foot this arrangement in pairs ceases and the pads are continued in a somewhat irregular fashion to the end of the body.

Branchiae are present from the 3rd chaetiger. They are small branching structures lying on the hinder face of the feet on a level with the outer edge of the elytrophores. In addition there are two or three minute globular processes, possibly branchial in function, lying on the front and hinder faces of the elytrophores and of the corresponding structures in the cirrigerous segments (Fig. 10 *f*). These last are provided with low oblong cushions running from the beginning of the foot to a point on a level with the inner edge of the elytrophores. To the inner edge of these cushions there are attached roughly fan-shaped flaps or membranes, the inner edge of which lies up against the sides of the median dorsal pads. They are what Seidler has named pseudo-elytra (Fig. 10 *g*). They are smooth on the dorsal surface, thin and transparent. On the under side they are provided with six raised ridges apparently muscular in character which exactly overlie corresponding dorso-ventral muscular ridges on the back. In addition the under surface carries about a dozen rows of small vesicles which are apparently glandular. The function of these organs is to me quite unknown.

The feet (Fig. 10 *h*) are triangular in outline. The dorsal cirri are long and slender, extending beyond the tips of the bristles. The ventral cirri are short and stout, barely reaching to the end of the foot. They taper to a point. Both dorsal and ventral cirri are smooth, but the feet, except on their upper surface, and indeed the whole of the under surface of the body, are covered with short clavate papillae with large heads. The notopod forms a small rounded lobe on the anterior face of the foot. It is supported by an aciculum and carries numerous, exceedingly fine, hair-like, barbed bristles (Fig. 10 *i*). The triangular neuropod carries a narrow fan-shaped bundle of about 15 completely smooth, stout, acicular bristles (Fig. 10 *k*). Not only is there no trace of ornamentation but there is scarcely any sign of curvature at the tip. In addition to these bristles there are at the base of the bundle one or two shorter bristles with lanceolate heads (Fig. 10 *l*). In the first foot the neuropod is much reduced and is only slightly larger than the notopod. The notopodial bristles are very numerous, but the neuropod carries only three or four bristles similar in type to those of the normal feet but much more slender.

Small nephridial papillae are apparent from the 4th chaetiger. The terminal segment carries a single pair of pygidial styles.

REMARKS. The only species with which, to the best of my knowledge, the present curious form is congeneric is *Euphione lobulata*, Seidler (1921, p. 89, and 1924, p. 99)

from Callao. From this *E. patagonica* differs in the ornamentation of the elytra, in the possession of two or three lanceolate bristles in the neuropod and in several further characters. Seidler's species was based on an anterior fragment, and he attributed the lack of ornamentation on the ventral bristles to loss from wear. The study of the present specimen leads me to the conclusion that this was not so, and that there exists a group of branchiate lepidonotid Polynoidae with pseudo-elytra and smooth ventral bristles.

Genus Macellicephala, McIntosh

Body rather stout. Between 17 and 29 chaetigers. Prostomium bilobed, usually with well-developed prostomial peaks. There are no lateral tentacles. 8–13 pairs of elytra. Feet biramous with the dorsal ramus much reduced. Dorsal bristles absent or present in small numbers. They may be spinous or smooth. Ventral bristles long, delicate and transparent.

Macellicephala mirabilis, McIntosh.

McIntosh, 1885, p. 121, pl. xvi, fig. 1; pl. xiiA, figs. 9–11.
Macellicephala sp., Monro, 1930, p. 47, fig. 10 *a–b*.
Macellicephala mirabilis, Augener, 1932 *b*, p. 102.

OCCURRENCE. St. 144 (1).

SPECIFIC CHARACTERS. A small species with 17–18 chaetigers and a length of 20–25 mm. The colour is pink to purple on the back. There are no eyes. The head is markedly bilobed. There are nine pairs of elytra. The dorsal ramus has a few bristles that are either smooth or show just a trace of serration towards the tip. The ventral bristles are long and transparent and lightly serrated on one side only.

REMARKS. The present specimen is from the same haul as the *Macellicephala* recorded by me in my previous Discovery report. It is in a slightly better state of preservation than the latter and dorsal bristles are present in a number of the feet. McIntosh and Augener state that they are smooth: under a high magnification I can see some very fine serrations towards the tip.

Genus Eucranta, Malmgren

As *Harmothoë*, except that the upper ventral bristles are of a special kind, being long and slender, with rows of pectinae and minutely bifid tips.

Middle ventral bristles bidentate ... ... *Eucranta mollis*
Middle ventral bristles unidentate ... ... *Eucranta villosa*, var. *notialis*

Eucranta mollis (McIntosh).

Eupolynoe mollis, McIntosh, 1879, p. 259, pl. xv, figs. 5–9.
Eucranta mollis, Bergström, 1916, p. 294.
Monro, 1930, p. 51.

OCCURRENCE. St. 363 (1); WS 211 (1); WS 871 (1).

SPECIFIC CHARACTERS. The head is round and the lateral tentacles are inserted ventrally. The prostomial peaks are represented by two minute papillae lying above the large, round anterior eyes. The hinder pair of eyes lies at the back of the head. The

elytra are arranged as in *Harmothoë*: they are large, soft and smooth except for a patch of small tubercles near the umbilicus. The dorsal bristles are stout and pectinated; the upper and lower ventral bristles are long and slender, with rows of teeth and very delicate forked tips. The middle ventral bristles are frilled and bidentate. Bergström saw no transitional bristles of a character intermediate between the two types in the neuropods. I cannot confirm this, for at the top of the sheaf of the middle bidentate bristles there are a few bristles longer and more slender than the rest of the middle bristles and with very delicate bidentate tips which are transitional between the two types. In the lower part of the neuropod the two types of bristle are more abruptly separated.

Eucranta villosa, Malmgren, var. **notialis**, var.nov. (Fig. 11 *a–h*).

OCCURRENCE. St. WS 788 (1).

VARIETAL CHARACTERS. This variety is based on an anterior fragment measuring 9 mm. by 4 mm. without the feet for 25 chaetigers. There is a typical harmothoid head (Fig. 11 *a*) with well-developed prostomial peaks. The anterior pair of eyes are almost invisible from above and lie in the middle of the prostomium underneath its lateral edges. The hinder pair lie at the postero-lateral edges of the head. The median tentacle, the palps and the tentacular cirri are all about equal in length and three times as long as the head. The lateral tentacles are minute and just reach to the end of the ceratophore of the median tentacle.

The elytra (Fig. 11 *b*) are fringed on their outer and hinder borders and their surface is dotted not only with cilia (much more sparsely, however, than in Malmgren's figure), but also with small tubercles of variable shape (Figs. 11 *c–e*). Towards the anterior border the tubercles are smaller than over the rest of the scale. The feet are of the usual harmothoid type with a well-developed notopodial bristle-bundle and a triangular neuropodium. The dorsal bristles are sabre-shaped and strongly pectinated. In the ventral ramus the bristles are long, delicate, slender and carry rows of spines. Only the two uppermost bristles (Fig. 11 *f*) show the minutely bifid apex characteristic of the genus. The following half-dozen bristles are bidentate (Fig. 11 *g*), for there is a very slender second tooth below the curved tip: the remainder of the bristles are unidentate (Fig. 11 *h*) and are similar to those of the stem-form. The dorsal cirri are long, reaching well beyond the tips of the bristles: the ventral cirri reach to the end of the foot.

REMARKS. The only substantial difference between the present southern form and the northern *villosa* is the presence in var. *notialis* of the bidentate bristles intermediate between the characteristic bifid bristles at the top of the ventral ramus and the unidentate bristles which form the great majority. I have never seen an example of Malmgren's species, but as far as I can gather from the accounts there is no transition between the upper bifid bristles and the unidentate bristles.

Genus **Polyeunoa**, McIntosh

Up to 100 segments and 30 pairs of elytra. The body is elongated and vermiform. The lateral tentacles are inserted ventrally. The first 15 pairs of elytra are attached to

the following chaetigers: 1, 3, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 25, 28, 31. More posteriorly the arrangement is very irregular. The dorsal bristles are stout, and either smooth or very lightly striated. The ventral bristles are toothed, terminally unidentate, and expanded towards the tip.

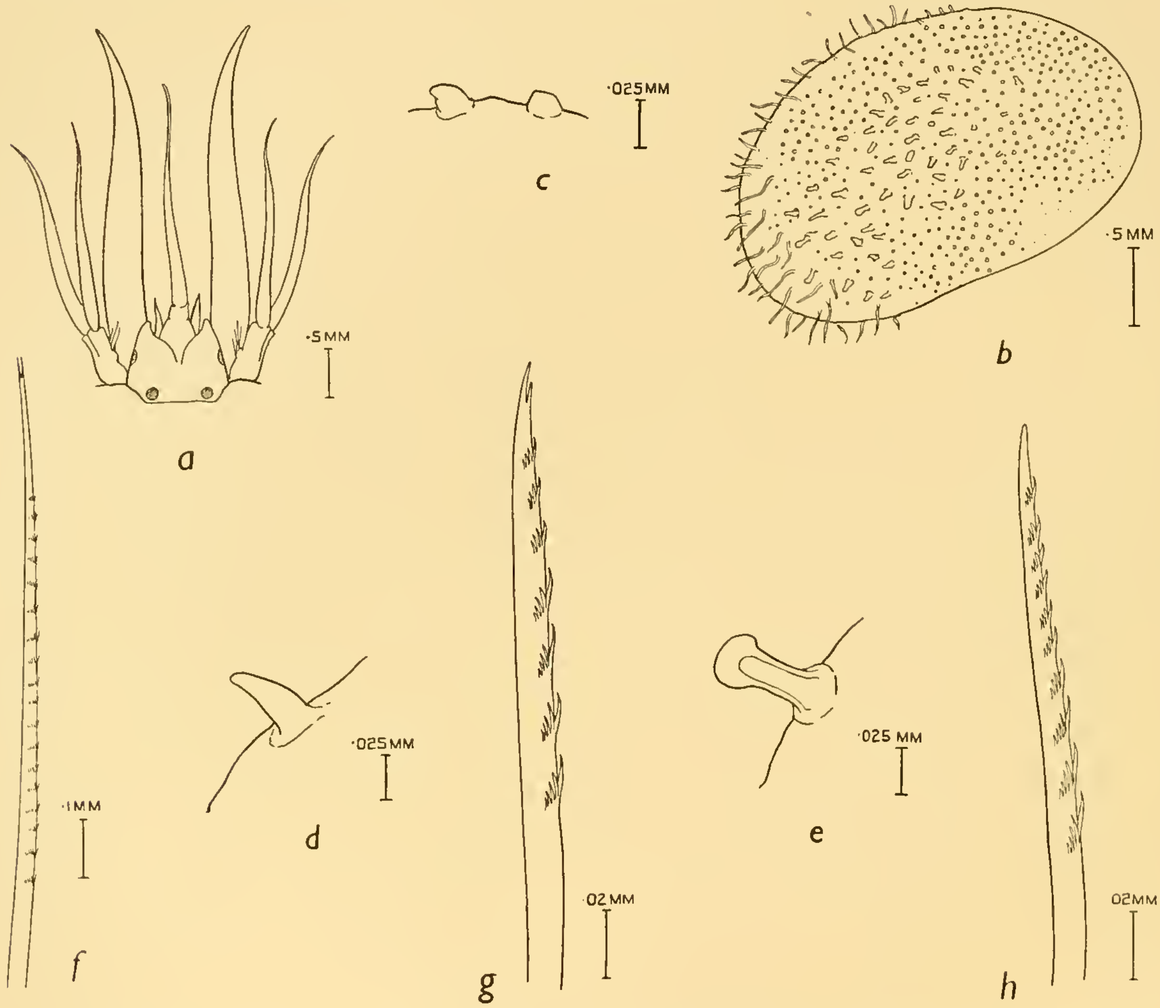

Fig. 11. *Eucranta villosa*, var. *notialis*.

a. Head from above.
b. Elytron.
c. Tubercle from front end of elytron.
d. Tubercle from middle of elytron.
e. Tubercle from hinder end of elytron.
f. Uppermost ventral bristle.
g. Bidentate ventral bristle.
h. Unidentate ventral bristle.

Polyeunoa laevis, McIntosh.

McIntosh, 1885, p. 76, pl. xii, fig. 2; pl. xx, fig. 8; pl. viiA, figs. 12–13.
Enipo rhombigera, Ehlers, 1908, p. 47, pl. iv, figs. 1–12.
Polyeunoa laevis, Bergström, 1916, p. 288, pl. iii, fig. 7.
Monro, 1930, p. 51.

Occurrence. St. 599 (numerous); 600 (5); 652 (10); WS 33 (1); WS 228 (1); WS 246 (numerous); WS 773 (fragments); WS 824 (numerous); WS 825 (numerous); WS 840 (numerous); WS 841 (numerous); WS 871 (numerous); WS 877 (5).

Specific characters. There is usually a reddish brown longitudinal dorsal stripe, and transverse markings more pronounced in the elytrophorous segments than in the rest. Occasionally they are both absent, or one may be present and the other absent. Gravier (1911, p. 81) gives a good account of the colour pattern.

Tentacles and cirri are smooth. Prostomial peaks are very little developed. The elytra are smooth except for a small patch of minute tubercles. Behind the 31st chaetiger their arrangement is extremely variable, and segments with a cirrus on one side and an elytron on the other are very common.

The bristles are as described for the genus.

Family SIGALIONIDAE

1.	No median tentacle ...	*Sigalion*
—	With a median tentacle ...	2
2.	With a dorsal cirrus on the 3rd chaetiger ...	*Psammolyce*
—	Without a dorsal cirrus on the 3rd chaetiger ...	3
3.	Ventral bristles compound falcigers ...	*Sthenelais*
—	Ventral bristles compound spinigers ...	*Leanira*

Genus Sigalion, Audouin and Milne-Edwards

Body long and vermiform. Head oval, longer than broad. There is no median tentacle, and the lateral tentacles are reduced to small papillae inserted on the front margin of the head. The 1st chaetiger carries dorsal and ventral tentacular cirri, a pair of long palps and on each side two bundles of simple bristles. There is a cirriform branchia on all segments behind about the 5th. The dorsal bristles are simple and denticulated. The ventral bristles are both simple and compound, the latter with short and single-jointed shafts or long and multi-articulate shafts. The elytra are furnished with pinnate papillae on the outer margin.

Sigalion ovigerum, Monro (Fig. 12 *a–d*).

Monro, 1924, p. 47, figs. 10–11.

Occurrence. St. 936 (New Zealand) (1).

Specific characters. The specimen is an anterior fragment measuring 60 mm. by 2 mm. without the feet for 135 chaetigers. This species is chiefly characterized by the absence of compound bristles with simple single-jointed blades, all the compound neuropodial bristles being multi-articulate. The prostomium (Fig. 12 *a*) is an oval plate with two pairs of minute eyes, one behind the other. There is a pair of papilliform lateral tentacles lying above the 1st chaetiger, and a facial tubercle on the under surface of the head. The dorsal cirrus of the 1st chaetiger is shorter than the head and the ventral is a little longer than this. They are about one-fourth of the length of the palps. The branchiae appear as slender papillae on the 3rd and 4th chaetigers and are fully developed by the 5th foot. The elytra are smooth and their posterior border is furnished with about a dozen pinnate papillae (Fig. 12 *b*) with cylindrical branches, which are about 10–15 in number. There is no sign of the modification of the elytra into pouches containing eggs recorded in the specimen from Port Jackson.

The dorsal ramus (Monro, *loc. cit.*, fig. 10) carries three ctenidia and a long cirriform stylode at its apex. The dorsal bristles are long, slender, capillary and denticulated and have very delicate bidentate tips. The neuropodium has a small papilla probably a bract, on its upper face. Above the neuropodial aciculum there are four kinds of bristles: (1) about half a dozen simple barbed bristles tapering to a point; (2) slender multi-articulate compound bristles (Fig. 12 *c*) with rows of teeth at the head of the shaft; (3) one or two compound multi-articulate bristles (Fig. 12 *d*) with smooth, curiously expanded, rounded, fist-shaped apexes to the shaft: in these the manner of articulation between shaft and blade is obscure; (4) slender multi-articulate compound bristles with normal, smooth tops to the shafts.

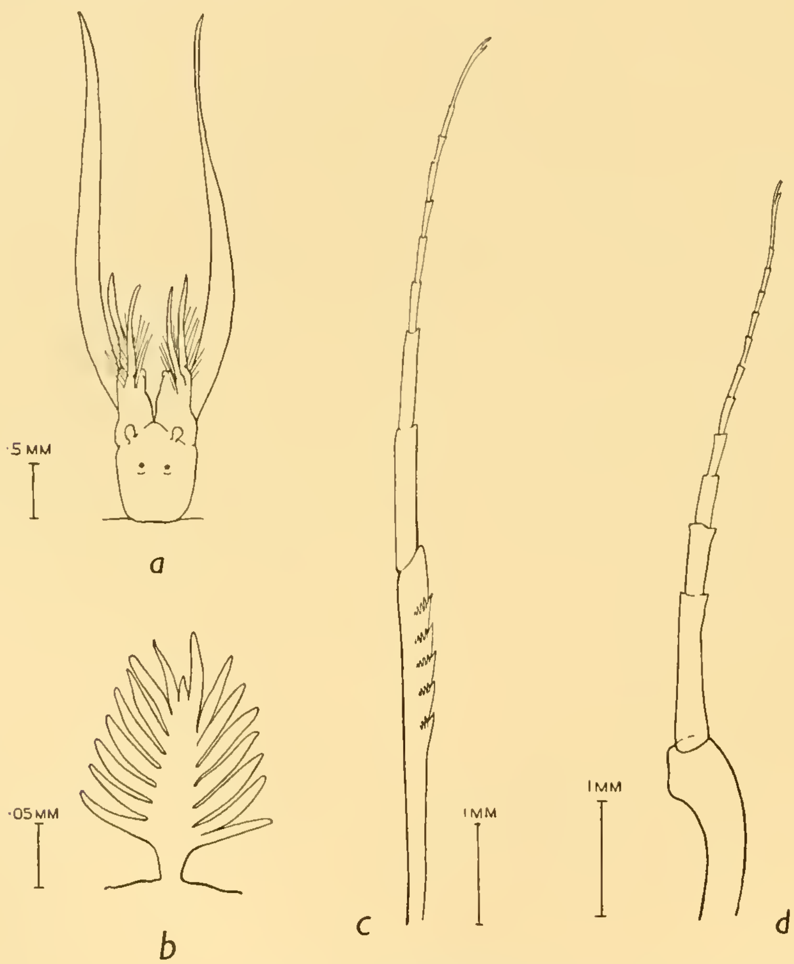

Fig. 12. *Sigalion ovigerum*.
a. Head.
b. Pinnate papilla from elytron.
c. Multi-articulate bristle with toothed shaft.
d. Special multi-articulate bristle.

Below the neuropodial aciculum the bristles are all multi-articulate with very long and delicate blades ending like the rest in a beak-like apex. They are thinner than the supra-acicular compound bristles, and the individual articles are longer. The tops of the shafts are smooth. The ventral cirri are subulate and reach to the end of the feet.

REMARKS. I know no other *Sigalion* in which there are no compound bristles with single-jointed blades.

Genus Leanira, Kinberg

Body long and slender with numerous segments. There is a median tentacle which usually has a ceratophore and a pair of ctenidia. The lateral tentacles are fused with the first foot, which carries dorsal and ventral tentacular cirri, a bundle of simple bristles, a cephalic scoop and a prebuccal lamella. There is a pair of long palps. Cirriform gills are present on all segments except a few in the anterior region. The dorsal bristles are simple capillaries with spiral whorls of teeth. The ventral bristles are compound spinigers with canaliculate blades.

Leanira quatrefagesi, Kinberg (Fig. 13).

Kinberg, 1857, p. 30, pl. ix, fig. 42 *a–e*.
Ehlers, 1901, p. 59, pl. 5, fig. 8.
Monro, 1924, p. 46.

OCCURRENCE. St. WS 214 (1); WS 770 (1).

SPECIFIC CHARACTERS. Body long, rectangular in section. Neither of the specimens is complete, but that from St. WS 770 is large and measures 185 mm. by 3 mm. without the feet for 140 chaetigers. The head (Fig. 13) is rectangular, broader than long, and towards the hinder border there is some diffuse black pigment, which may be ocular pigment. Beginning in the hinder third of the prostomium there is a kind of raised ridge running forward to the end of the head and continuous with the median tentacle. This I take to be the ceratophore of the median tentacle fused with the head. The median tentacle is spindle-shaped, shorter than the head, and tapers to a fine tip. I see no ctenidia in connection with the median tentacle. The lateral tentacles arise from the dorsal surface of the first foot at the junction between the foot and the head and are similar in form to the median. The first foot also carries a dorsal cirrus, reaching back to about the 4th chaetiger, a ventral cirrus about one-third as long as the dorsal, and a bundle of long capillary bristles. The palps are very long, reaching back well beyond the 10th chaetiger. At the base of the first pair of feet there is a cephalic scoop and a prebuccal lamella.

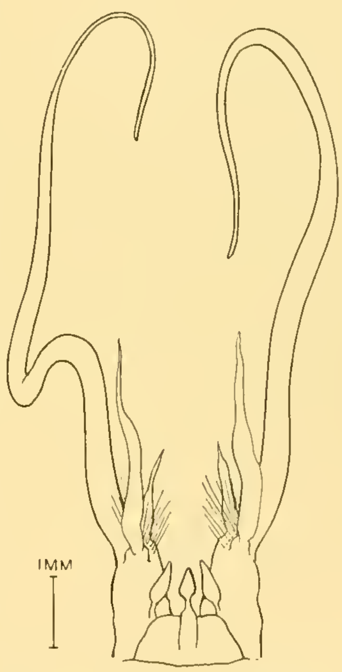

Fig. 13. *Leanira quatrefagesi.* Head from above.

The elytra are tinged with orange-brown. They are without cilia or papillae, being quite smooth. The cirriform gills appear as small papillae on about the 20th chaetiger and reach their full development about 10 chaetigers further back.

The feet are figured both by Kinberg and by Ehlers. Neither of these authors record parapodial ctenidia, and I failed to find any on the material obtained in the Straits of

Magellan by the Alert Expedition (Monro, *loc. cit.*, 1924). In the smaller specimen from St. WS 214 they are again not apparent, but in the large fragment from St WS 770 two ctenidia are clearly visible on the upper surface of the feet. Stylodes are numerous, there being about half a dozen in each ramus.

The dorsal bristles are of two kinds, the one very fine, long, minutely hispid capillaries; the other stouter and with spiral whorls of small teeth. It is possible that the former of these two types of bristles is only a more delicate form of the latter, but even under a very high magnification I cannot see whorls of teeth. The ventral bristles are typical of the genus. They are compound, with pointed, canaliculated blades.

REMARKS. This is the genotype of Kinberg's *Leanira*. Willey's genus *Sthenolepis* covers those *Leanira* which have a median tentacle having a ceratophore and ctenidia; and Willey wishes to restrict *Leanira* to those species which lack the ceratophore and tentacular ctenidia. It is noteworthy therefore that Kinberg's genotype probably has a median ceratophore, but whether the prostomial ridge with which the median tentacle is continuous is in fact a ceratophore seems to me to be not yet settled. Anyhow I agree with Horst and Fauvel that *Sthenolepis* is unjustified.

Genus **Psammolyce**, Kinberg

Body long, vermiform. Median tentacle on anterior margin of head. No tentacular ctenidia. Lateral tentacles attached to first foot. A dorsal cirrus on the 3rd chaetiger. Cirriform branchiae on every foot except the first. The back and elytra coated with sand-grains. Dorsal bristles slender, barbed capillaries. Ventral bristles compound falcigers.

Psammolyce semiglabra, n.sp. (Fig. 14 *a–g*).

OCCURRENCE. St. 936 (New Zealand) (1).

DESCRIPTION. The single anterior fragment measures 55 mm. by 7 mm. without the feet for 65 chaetigers. In spirit the dorsal surface is colourless for about the first 20 chaetigers; behind this it is pale brown, the colour deepening from before backwards. The ventral surface is a uniform pale brown except in the neighbourhood of the head. The body is quadrangular in section and somewhat convex dorsally. On the ventral surface there is a deep median longitudinal groove, and on the dorsal surface there is also a slight median longitudinal depression which may be an artefact. The first three pairs of elytra almost meet in the median line, but over most of the body the elytra cover the deep sides of the body and leave most of the dorsum bare. About the first 30 segments are dorsally almost free from adhesive papillae and sand-grains: further back they are rather sparsely dotted over the dorsum, being most abundant in the region of the apex of the elytra. They increase considerably in density from before backwards. The ventral surface is covered with small, globular papillae. *There are no filiform papillae on the ventral surface.*

The first pair of elytra are lost: they probably concealed the head. The prostomium (Fig. 14 *a*) is long, soft, and conical and ends in a small median tentacle, about one-third as long as the head. At about its middle and on its lateral edges there are two pairs

of almost invisible eyes lying one beneath the other. A large part of the head is covered by a dorsal fold from the following segment. The first pair of feet carry the lateral tentacles, which are about equal in length to the head, a dorsal cirrus a little longer than the lateral tentacles, a ventral cirrus of about twice this length, and a bundle of long, slender bristles. The palps are about three times as long as the ventral cirrus of the 1st

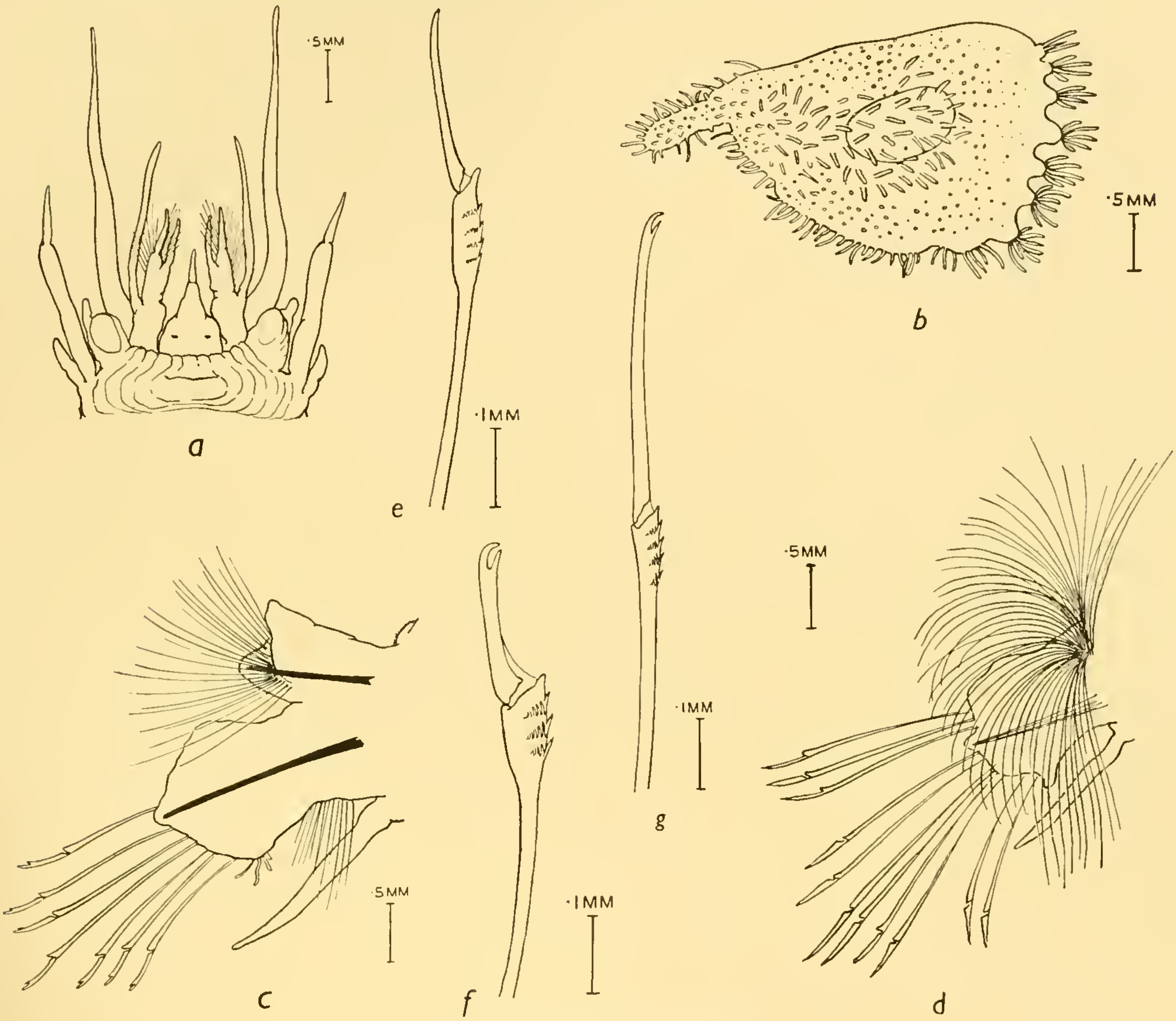

Fig. 14. *Psammolyce semiglabra.*

a. Head from above.
b. Elytron from middle of body.
c. Middle foot from in front.
d. Middle foot from behind.
e. Unidentate ventral bristle.
f. Shorter bidentate ventral bristle.
g. Longer bidentate ventral bristle.

chaetiger. The 2nd chaetiger bears the first pair of elytra, a short branchia and a long ventral cirrus. The 3rd chaetiger carries a pair of dorsal cirri long enough to reach to the tips of the bristles. In these cirri the style is only about half as long as the ceratophore, at the base of which there is a short branchia.

The elytra are borne on segments 2, 4, 5, 7, etc., to 27, after which they occur on every segment. They vary somewhat in shape according to their position in the body. In front they are reniform, but except for the first few segments they are semi-circular with the straight edge to the front (Fig. 14 *b*). At their most dorsal point there is a single club-shaped papillated process. This club-shaped process is absent from the first few scales and is not fully developed before about the 20th chaetiger. Except on its front face the scale is fringed with long adhesive papillae. These are not continuous on the lower border of the scale. This lower border has a wavy edge, and the papillae are gathered into bunches or tufts attached to the tops of the waves and from the emarginate parts of the border papillae are absent.

In addition to the marginal papillae the elytra carry numerous adhesive papillae and numerous small grape-like tubercles. The umbilicus is oval. Below each elytron there are a gill and a ctenidium. Above the dorsal ramus of the foot there is a semicircular membrane which may be a second ctenidium, but I have not succeeded in seeing any cilia.

The foot is triangular (Fig. 14 *c–d*). The dorsal ramus consists of an enormous fan-shaped bundle of slender barbed bristles situated on the hinder face of the neuropod. The dorsal bristles project almost as far below the ventral ramus as above it. The ventral bristles are variable, especially in regard to the presence or absence of a second tooth on the blades. The most usual arrangement is as follows. At the top of the neuropod there are usually about half a dozen bristles with rather long and slender blades with unidentate tips (Fig. 14 *e*). Below these the bristles are bidentate and the blades become rather stouter and shorter from above downwards as far as a short distance below the aciculum (Fig. 14 *f*). Below this and standing a little apart from the rest there is a bundle of much more slender bristles with long and delicate bidentate blades (Fig. 14 *g*). The articulation is heterogomph throughout, and the tops of the shafts are heavily denticulated.

At the base of the chaeta-sac there is a tuft of filiform processes that I take to be stylodes. The tapering ventral cirrus reaches to the end of the foot.

REMARKS. This species is related to *P. antipoda* (Schmarda), from which it differs in having no filiform papillae on the ventral surface and also in having the lower margin of the elytra wavy with the papillae gathered in tufts. In fact there is to my knowledge no other *Psammolyce* which has this combination of characters.

Genus Sthenelais, Kinberg

A long median tentacle with ctenidia at the base. Lateral tentacles reduced to small papillae on the dorsal surface of the first foot. Branchiae on every foot except the first few. Dorsal bristles spinous capillaries. Ventral bristles compound falcigers and also a few simple barbed chaetae.

Sthenelais limicola (Ehlers), var. novae-zealandiae, var.nov. (Fig. 15).

OCCURRENCE. St. 936, New Zealand (3).

Varietal characters. The only difference that I can find between these specimens and a typical example of this species from northern European waters is that in the elytra from the middle of the body, on each side of the opening caused by the indentation of the scale on its outer border, there are two or three filiform papillae (Fig. 15) not present in the northern form. Moreover, the bract above the neuropodium is more flattened and tongue-shaped than in the stem-form and lacks the terminal stylode. Otherwise, in the shape of the head, in the form of the minute elytral vesicles and in the structure of the feet and bristles these specimens are indistinguishable from the European form.

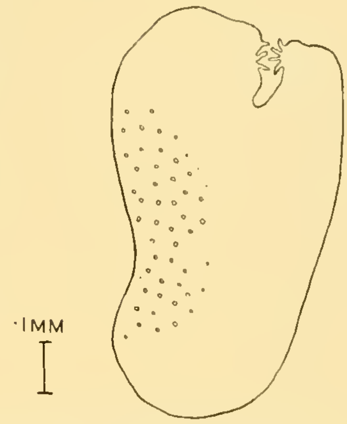

Fig. 15. *Sthenelais limicola*, var. *novae-zealandiae*. Elytron.

I have not been able to compare the scales from the anterior region of the body, for these are all lost from the present specimens, which are in rather poor condition. They are all incomplete and the largest measures 20 mm. by 1 mm. without the feet for about 80 chaetigers.

Family PHYLLODOCIDAE

1.	Tentacular cirri three pairs	*Mystides*
—	Tentacular cirri four pairs	2
—	Tentacular cirri two pairs	4
2.	With a median tentacle	*Eulalia*
—	Without a median tentacle	3
3.	First two tentacular segments fused. Body short and broad...	*Genetyllis*
—	First two tentacular segments separate. Body long and narrow	*Phyllodoce*
4.	Elongate, benthic animals	*Eteone*
—	Short, pelagic animals	5
5.	With foliaceous dorsal and ventral cirri	*Lopadorhynchus*
—	With cylindrical dorsal and ventral cirri	*Pelagobia*

Genus Phyllodoce, Savigny

Body elongate with numerous segments. Head cordiform or oval. There are four tentacles. Papillae at base of proboscis either diffuse or arranged in longitudinal rows. Four pairs of tentacular cirri distributed over three more or less distinct segments. Feet uniramous or sesquiramous. Dorsal and ventral cirri foliaceous, variable in shape. Bristles compound.

1.	Dorsal cirri ear-shaped or semicircular...	2
—	Dorsal cirri oval, lanceolate or subrectangular	3
2.	With eyes and with an aciculum in the dorsal cirrophore	*P. longipes*
—	Without eyes and without an aciculum in the dorsal cirrophore	*P. bowersi*
3.	With a pedal lobe and bristles in the third tentacular segment	*P. patagonica*
—	Without a pedal lobe and bristles in the third tentacular segment	*P. madeirensis*

Phyllodoce longipes, Kinberg.

Monro, 1930, p. 73, fig. 21, with synonymy.

OCCURRENCE. St. WS 239 (1); WS 841 (1).

SPECIFIC CHARACTERS. The head is cordiform and has a nuchal papilla. The tentacular formula is $1+B\frac{a1}{a1}+B\frac{a1}{aN}$. The feet are sesquiramous and have a small aciculum running up the broad dorsal cirrophore. The dorsal cirrus is more or less ear-shaped with the long axis at right angles to the cirrophore. The pedal lobe has a small digitiform process at its end, and the ventral cirri are large, foliaceous and pointed.

The papillation of the proboscis is unknown.

The most complete specimen of this species that I have seen is that described by me (*loc. cit.*) in 1930. This measured 110 mm. by 7 mm. including the feet for 140 chaetigers.

Phyllodoce patagonica (Kinberg).

Anaitides patagonica, Bergström, 1914, p. 147, fig. 46 *a–c*, with synonymy.

OCCURRENCE. St. WS 177 (1); WS 239 (2 juv.); WS 274 (1); WS 771 (6); WS 784 (1); WS 785 (1).

SPECIFIC CHARACTERS. A narrow, elongate species with up to about 200 chaetigers. A nuchal papilla is present and the tentacular formula is $1+O\frac{a1}{a1}+B\frac{a1}{aN}$. In the first few segments the dorsal cirri are broadly lanceolate, but in the middle and hinder region they are more or less rectangular. The ventral cirrus tapers to a point. The papillae of the proboscis are arranged in 13 rows of which one is mid-dorsal and 12 are lateral. There are about five papillae in the mid-dorsal row and nine or ten in the lateral rows.

Phyllodoce madeirensis, Langerhans.

Fauvel, 1923, p. 150, fig. 53 *d–h*.
Benham, 1927, p. 74.

OCCURRENCE. St. 934, New Zealand (2).

SPECIFIC CHARACTERS. The head is cordiform and there is a nuchal papilla. The tentacular formula is $1+O\frac{a1}{a1}+O\frac{a1}{aN}$. The dorsal cirri are very variable: they may be oval, lanceolate, asymmetrical, straight or incurved, or subrhomboidal. The ventral cirrus is oval and tapers to a point.

The proboscis carries on each side six lateral rows of 10–12 papillae and usually also a median row of four to six papillae.

In the present specimens the dorsal cirri are more or less symmetrically lanceolate. There is no median row of papillae.

REMARKS. I cannot agree that this species is the same as *P. patagonica*, Kinberg. In the first place in *P. patagonica* there is a small but distinctly developed pedal lobe with bristles in the third tentacular segment, which is wholly absent in *madeirensis*; and in the middle and hinder regions the dorsal cirri have a constant and characteristic subrectangular form.

Phyllodoce bowersi, Benham.

Benham, 1927, p. 77, pl. A, figs. 27–31.
Monro, 1930, p. 72.

Occurrence. St. WS 215 (1).

Specific characters. The present specimen is small, measuring only 14 mm. by 1 mm. for 63 chaetigers, whereas Benham's type measured 60 mm. by 2·5 mm. without the feet for 120 chaetigers. In spirit this is a cream-coloured species. The head is rounded, as broad as long, and there are no eyes. A nuchal papilla is present. The tentacular segments are distinct, and though I have not sufficient material to determine the tentacular formula I can report the presence of bristles in the second and third tentacular segments. The dorsal cirri are adherent, transversely elliptical in form and with an outer edge which is a continuous curve. The ventral cirri are large, oval and reach nearly to the end of the lobe. Bristles with long appendix and articular cup with one side produced into a long tapering process. Pharyngeal papillae arranged in six or seven regular longitudinal rows.

Genus **Eulalia**, Oersted

Body elongate with numerous segments. Head oval or conical. There are five tentacles. Proboscis smooth or diffusely papillated. Four pairs of tentacular cirri distributed over three segments. Feet uniramous. Pedal cirri foliaceous, cordiform, oval or lanceolate. Bristles compound.

Dorsal cirri thin and lanceolate; proboscis papillated... ... ... *E. magalhaensis*
Dorsal cirri stout and ovate. Proboscis smooth ... ... *E. picta*

Eulalia magalhaensis, Kinberg.

Steggoa magalhaensis, Bergström, 1914, p. 129, with synonymy.
Eulalia magalhaensis, Monro, 1930, p. 75.

Occurrence. St. 53 (1).

Specific characters. A rather elongate species with up to 350 chaetigers. There are two pairs of eyes behind the median tentacle. The proboscis is diffusely papillated. The tentacular formula is $1 + O\frac{01}{a1} + B\frac{a1}{aN}$, and the ventral cirrus of the second tentacular segment is foliaceous. The dorsal cirri are elongate and lanceolate, about three times as long as broad. The ventral cirri are oval and with blunt ends. I find that *Eulalia anomalochaeta*, mihi (1930), is the same as *Pterocirrus hunteri*, Benham (1921).

Eulalia picta, Kinberg.

Notalia picta, Bergström, 1914, p. 127, text-fig. 34, with synonymy.

Occurrence. St. WS 804 (2).

Specific characters. A slender, elongate species with (in spirit) a dark green body and brown cirri. The tentacular formula is (*fide* Bergström) $1 + B\frac{01}{a1} + B\frac{01}{aN}$, and the ventral cirrus of the second tentacular segment is stout and ventrally asymmetrical. The proboscis is smooth. The dorsal cirri are thick and ovate. The bristles have the head of the shaft denticulated and short end-pieces.

Genus **Genetyllis**, Malmgren, *char. emend.* Bergström.

Body short and rather broad. No median tentacle. Four pairs of tentacular cirri, either slender or spindle-shaped. The first tentacular segment is free of the head, and the first two tentacular segments are fused into a single structure carrying three pairs of tentacular cirri and a pedal lobe with bristles but no acicula. Dorsal cirri large and foliaceous; the ventral cirri are also foliaceous and curve ventrally upwards and downwards from behind the foot. The anal cirri are large and cylindrical.

Genetyllis polyphylla (Ehlers).

Bergström, 1914, p. 161, fig. 55, with synonymy.

Occurrence. St. WS 27 (4); WS 123 (2); MS 64 (7).

Specific characters. All the present specimens are damaged and the largest measures 16 mm. by 2 mm. for 54 chaetigers. The colour is reddish yellow with orange cirri. The head is rounded and longer than broad. There is a pair of large eyes. No nuchal papilla. The tentacular formula is $1 + B\frac{O1}{O1} + B\frac{O1}{aN}$ (*fide* Bergström). The dorsal cirri are very asymmetrically cordiform with the apex pointing towards the dorsal median line. The ventral cirri are oval with the long axis pointing upwards and downwards. The bristles have short, rather broad end-pieces.

Genus **Eteone**, Savigny

Body elongate with numerous segments. Head triangular, truncated in front. Four tentacles, and on the first segment two pairs of tentacular cirri. The second segment has a foliaceous ventral cirrus, but no dorsal cirrus: it may have a pedal lobe with or without bristles. Dorsal and ventral cirri foliaceous. Proboscis smooth or carrying lateral rows of papillae.

Eteone sculpta, Ehlers.

Bergström, 1914, p. 195, text-fig. 73 *a*, *b*, with synonymy.

Occurrence. St. WS 755 (1).

Specific characters. The present specimen measures 19 mm. by 2 mm. for about 160 chaetigers. There are purple transverse segmental bands across the back and the cirri are yellow. The head is more or less rectangular, slightly longer than broad. The proboscis is smooth. The tentacular formula is $O\frac{O1}{O1}$. The second segment has bristles, but no dorsal cirrus. The dorsal cirri are broadly oval, thick and at their base about as broad as long. In the bristles one side of the articular cup is produced into a long finely denticulated process.

Remarks. Augener (1932 *a*, p. 26) is, I think, justified in making *E. rubella*, Ehlers, a synonym of this species.

Genus **Lopadorhynchus**, Grube

Body short, head broader than long, two eyes and four tentacles. Two pairs of tentacular cirri and sometimes a third rudimentary pair on a single segment, which is

fused with the head and devoid of bristles. The first few chaetigers carry simple bristles with hooked ends, the remainder carry compound bristles and usually a few simple bristles. The pedal lobe is rounded and the dorsal and ventral cirri are foliaceous.

First two chaetigers very much larger than the rest and carrying a number of stout hooks surrounded by a sinuous collar ... ... *L. uncinatus*
First two chaetigers slightly larger than the rest and carrying small hooks and no collar ... ... *L. krohnii*, var. *simplex*

Lopadorhynchus krohnii (Claparède), var **simplex**, Monro.

Monro, 1930, p. 79, fig. 23 *a*, *b*.

Occurrence. St. 702 (1).

Varietal characters. Up to about 10 mm. in length. In the younger specimens eyes are not visible, but in adults a pair is present as in the stem-form. The first two chaetigers have rather stout, cylindrical pedal lobes, about half a dozen simple bristles with hook-like ends, and no ventral cirri. The pedal lobes of the remaining chaetigers are flatter and have oval dorsal and ventral cirri. The bristles are arranged fan-wise and consist of paddle-shaped compound chaetae with oval blades denticulated on one edge. There are no simple hooks behind the second chaetiger. The absence of simple hooks from all chaetigers except the first two is the only substantial difference between the variety and the stem-form. The latter is described by Fauvel (1923, p. 185, fig. 68 *a–d*) and by Bergström (1914, p. 180, fig. 68 *a*, *b*). The present specimen is a young one, measuring only 5 mm. by 1 mm. without the feet for 20 chaetigers.

Lopadorhynchus uncinatus, Fauvel.

Fauvel, 1923, p. 184, fig. 67 *a–g*.

Occurrence. St. 714 (1).

Specific characters. The specimen measures 18 mm. by 2 mm. without the feet for 32 chaetigers. The head is broader than long and there are four tentacles. There are two pairs of tentacular cirri reaching back to the 2nd chaetiger and a third rudimentary pair situated at the base of the second pair. There is a pair of large eyes. The first two pairs of feet are very much larger than the rest, being very stout and rounded in section. They carry a number of large dark brown hooks which are surrounded by a delicate sinuous membrane. There is a small dorsal cirrus, but the ventral cirrus is absent. These first two chaetigers are clearly separated by a constriction from the rest of the body. The normal feet point backwards and consist of a lanceolate pedal lobe with a projecting aciculum, a large rounded vertical lamella, a stout, lanceolate dorsal cirrus and a conical ventral cirrus. The bristles have a fan-shaped arrangement and are all compound except in the 3rd chaetiger which has in addition a few simple bristles. The shafts end in a point, below which there is a kind of notch with which the broad paddle-shaped blade is articulated. This blade has a few delicate denticulations on one edge.

Remarks. This specimen agrees in detail with Fauvel's description. I believe this to be the first record of this species from the South Atlantic.

Genus Pelagobia

Four tentacles. Two pairs of tentacular cirri, a dorsal and a ventral, borne by a single segment which also carries bristles. The dorsal cirrus of the 2nd chaetiger is reduced or absent. The feet are uniramous and carry slender, cylindrical dorsal and ventral cirri. The feet have a single aciculum and compound bristles with denticulated blades. The proboscis is smooth.

Pelagobia longicirrata, Greeff.

Fauvel, 1923, p. 192, fig. 72 *a–e*.
Augener, 1929, p. 291, with synonymy.

Occurrence. St. 17 (6); 41 A (3); 41 B (6); 41 D (5); 41 E (4); WS 40 (4); WS 44, 1000–750 m. (1), and 750–500 m. (5); WS 555 (3).

Specific characters. A small species measuring up to about 12 mm. in length with 25 chaetigers. The head is conical and truncated in front. There is a single pair of eyes. Four small thread-like tentacles. The two pairs of tentacular cirri are long and subulate and the first segment has a small pedal lobe with a few bristles. There is no dorsal cirrus on the 2nd chaetiger.

The following segments carry slender tapering dorsal and ventral cirri. The pedal lobe is conical and has an aciculum and numerous long, delicate compound bristles. These have the end-pieces denticulated, and often the head of the shaft also. The end-pieces have a delicate border on the side opposite the teeth.

Remarks. I have examined the bristles of a random sample of these specimens and in none can I find any denticulation of the head of the chaetal shafts. In this they differ from the northern representatives of the species.

P. longicirrata is a very common species in the southern cold-water plankton. Augener found it in the Weddell Sea.

Genus Mystides, Théel

Small, elongate animals. The head is rounded. There is a pair of eyes and four tentacles. No median tentacle and no occipital papilla. Three pairs of tentacular cirri. The formula is $1 + B\frac{1}{1}$. The feet are uniramous. Dorsal and ventral cirri foliaceous or more or less globular. Bristles compound. Proboscis with soft papillae.

Mystides notialis, Ehlers.

Ehlers, 1913, p. 457, pl. xxix, figs. 1–4.

Occurrence. St. WS 226 (1).

Specific characters. The present specimen measures 13 mm. by 0·5 mm. for 52 chaetigers. It corresponds exactly to Ehlers' account. There is a pair of dark eyes and four very slender, transparent tentacles. The first segment is achaetous and carries a pair of tentacular cirri; the second segment has bristles and two pairs of tentacular cirri, a dorsal and a ventral. All the tentacular cirri are swollen towards the base and are apically slender and filiform. The normal dorsal and ventral cirri are more or less globular. The bristles are compound and have a bifid articulation. The head of the shaft

is scarcely, if at all, denticulated. The end-piece is very slender and rather short. There is a pair of globular anal cirri.

REMARKS. I find it impossible to decide whether this species is the same as Théel's *M. borealis* without a direct comparison, and unfortunately Théel's species is not represented in the museum collection. The present species has not been seen since its original description.

Family ALCIOPIDAE

1.	Bristles all of one kind	2
	Bristles of more than one kind	4
2.	Bristles all long simple swimming chaetae	*Alciopa*
	Bristles all long compound swimming chaetae	3
3.	The foot has two cirriform terminal appendages	*Greeffia*
	The foot has one cirriform terminal appendage	*Vanadis*
	The foot has no cirriform terminal appendage	*Torrea*
4.	Both long swimming chaetae and short acicular bristles present	5
5.	Long swimming bristles simple...	*Callizonella*
	Long swimming bristles compound	*Callizona*

Genus Alciopa, Audouin and Milne-Edwards

Body elongate and transparent. The head ends in a pair of enormous eyes. Five tentacles, of which the median is very small. Proboscis with a crown of papillae, of which the two lateral papillae are only slightly longer than the rest. Three pairs of tentacular cirri, followed by about three chaetigers with small undeveloped feet. In the female the dorsal cirri of the first pair of feet are converted into seminal pouches. Dorsal and ventral cirri are foliaceous. The pedal lobe has no terminal appendage. The bristles are all long, delicate, capillary and simple. Prominent segmental glands are present.

Alciopa cantrainii (Delle Chiaje).

Fauvel, 1923, p. 203, fig. 76 *a–c*.

OCCURRENCE. St. 707 (1).

SPECIFIC CHARACTERS. The characters of this species are those of the genus.

Genus Vanadis, Claparède

Long, cylindrical, transparent animals. The head ends in a pair of enormous eyes. The proboscis has a crown of long papillae. There are three to five pairs of tentacular cirri. In the female a few of the anterior dorsal cirri are converted into globular seminal pouches. The pedal lobe ends in a single cirriform process. The dorsal and ventral cirri are foliaceous. The bristles are all of a similar kind, very long, fine, transparent and compound. Prominent, deeply pigmented segmental glands are present.

1.	Body colour purplish brown	*V. violacea*
	Body colourless, transparent	2
2.	With three pairs of tentacular cirri	*V. formosa*
	With four pairs of tentacular cirri	3
3.	The proboscis carries a pair of long, lateral cirriform processes	*V. crystallina*
	The proboscis is devoid of cirriform processes	*V. antarctica*

Vanadis antarctica (McIntosh).

Alicopa antarctica, McIntosh, 1885, p. 175, pl. xxviii, figs. 2, 3, 4; pl. xxxii, fig. 12.
Vanadis antarctica, Benham, 1921, p. 58, pl. viii, figs. 61–63, with synonymy.

Occurrence. St. 334 (1); 362 (1); 373 (1); 461 c (1); 527 (3); 533 (1); 569 (1); 579 (1); 590 (1); 591 (1); 619 (1); 1148 (1); WS 200 (1); WS 408 (1); WS 411 (1); WS 537 (1); WS 550 (1); WS 551 (2); WS 552 (1).

Specific characters. Four pairs of tentacular cirri, followed by about a dozen segments in which the feet are reduced in size, being smaller than the normal feet of the rest of the body. This area with reduced feet is nearly always pigmented and gives the animal a characteristic appearance of having a pigmented neck. In the female the first two feet have the dorsal cirri converted into seminal pouches. The mouth of the proboscis has only rather short papillae and is devoid of the pair of lateral tentacle-like processes present in *V. formosa*. The pigmented neck is followed by a short unpigmented area of about three segments, and this again by about three pigmented segments. Behind this the pigment is usually confined to the lateral glands and does not spread over the dorsum. The arrangement of the glands and their accompanying pigment is irregular up to about 30th–50th segment, behind which there is a pair of glands in each foot. There are the usual foliaceous dorsal and ventral cirri on the feet, and a lanceolate pedal lobe ending in a projecting aciculum and a small cirriform process. The bristles are very long and delicate and the articulation between shaft and blade very difficult to see.

This is a fairly large species with a breadth of about 5 mm. My most complete fragments measure about 150 mm. in length.

Vanadis formosa, Claparède.

Fauvel, 1923, p. 205, fig. 77 *a–c*.

Occurrence. St. 404 (2); 407 (2); 701 (1); 704 (1); 705 (1); 713 (2); 714 (1 and 2 juv.).

Specific characters. Four small digitiform lateral tentacles and a median tentacle. Three pairs of tentacular cirri. The mouth of the proboscis has, in addition to a number of rather short papillae, on each side a long tentacle-like process. In the female the dorsal cirri of the first two feet are converted into large globular seminal pouches. In the male the first foot is reduced to a dorsal and ventral cirrus. The remaining feet have a lanceolate pedal lobe with a long, projecting aciculum, foliaceous dorsal and ventral cirri and numerous very fine compound bristles. The pedal lobe ends in a small cirriform process. Every chaetiger, except the first three, carries a large dark brown gland.

Remarks. In the colder waters of the southern hemisphere the place of this species is taken by *V. antarctica* (McIntosh).

Vanadis crystallina, Greeff.

Fauvel, 1923, p. 206, fig. 77 *d, e*.

Occurrence. St. 708 (2); 709 (1).

Specific characters. A small thread-like species with up to about 150 segments. The proboscis carries a pair of long lateral processes. Four pairs of tentacular cirri.

The fourth tentacular cirrus is foliaceous and much larger than the two preceding tentacular cirri. In the female the first foot only has the dorsal cirrus converted into a seminal pouch. About the first five feet behind the tentacular region are small and undeveloped and usually lack bristles. A normal foot consists of a lanceolate pedal lobe ending in a small cirriform process, a lanceolate dorsal cirrus and an oval ventral cirrus. The bristles are all very long, fine, compound capillaries. Segmental glands are found on every foot behind the second.

Vanadis violacea, Apstein.

Apstein, 1893, p. 143, pl. v, figs. 1–4.

Occurrence. St. 413 (1); 419 (1).

Specific characters. These specimens are fragmentary and the largest has a breadth of 3 mm. without the feet. The body has a less fragile and transparent appearance than that of most Alciopids, and recalls rather that of a bottom-living Phyllodocid. The colour is uniform purplish brown. The head extends beyond the eyes. The proboscis has a crown of small papillae and is devoid of lateral tentacle-like processes. There are three short stout pairs of tentacular cirri on separate segments. Of these the middle pair is twice as long as the other two in the present specimens. The fourth segment carries a foliaceous cirrus, below which is a minute process which I take to be a rudimentary pedal lobe. Whether this foliaceous cirrus of the fourth segment is to be regarded as a tentacular cirrus or as the first dorsal cirrus of the body is not clear. Apstein gives four pairs of tentacular cirri in his original description and three pairs in his Plankton Expedition paper of 1900. My own inclination is to give only three pairs of tentacular cirri and to treat the foliaceous cirrus of the fourth segment as part of the body region. The bristles begin with the fifth segment, in which the ventral cirrus is somewhat reduced.

The feet are stouter than is usual in the Alciopids. Normally there is a lanceolate pedal lobe ending in a small cirriform appendage, a large cordiform dorsal cirrus, and a broadly lanceolate ventral cirrus. The bristles consist of very numerous, long, compound capillaries. There are segmental glands both above and below the feet.

Remarks. The colour and general aspect of solidity of this species are characteristic. The locality of the type specimen described by Apstein is not known.

Genus **Greeffia**, McIntosh

Body rather massive for an Alciopid and tapered posteriorly. The head does not extend beyond the eyes. There are five tentacles and a pair of enormous eyes. The proboscis carries a pair of long cirriform processes. There are three or four pairs of tentacular cirri. There are no undeveloped parapodia in the anterior region. The feet end in a pair of small, cirriform processes. The dorsal and ventral cirri are foliaceous. There are prominent segmental glands both dorsally and ventrally. The bristles are all slender, compound, capillary, swimming bristles.

Greeffia oahuensis, McIntosh.

McIntosh, 1885, p. 182, pl. xxviii, figs. 5–7; pl. xxxii, fig. 11; pl. xva, fig. 4.
Monro, 1930, p. 82, fig. 25.

Occurrence. St. 413 (1).

Specific characters. The largest example of this species known to me is a fragment measuring 39 mm. by 4 mm. without the feet for 48 chaetigers. The present specimen, also fragmentary, measures 13 mm. by 4 mm. without the feet for 30 chaetigers. In spirit the colour of the body is pale brown; the dorsal segmental glands are black and the ventral colourless; the pedal cirri are white. There are three pairs of tentacular cirri. The proboscis carries a pair of long cirriform lateral processes. The foot ends in a pair of subequal cirriform appendages. The dorsal cirri are large, imbricating and cordiform. The ventral are also large, and rounded. The prominent cushion-like segmental glands, which are present both above and below the feet, are not apparent in the first few segments. The chaetae are all slender, compound, capillary swimming bristles.

Remarks. This species is distinguished from *G. celox* (Greeff) by the possession of three instead of four pairs of tentacular cirri.

Genus **Callizona**, Greeff

Body elongate, with numerous segments. The head extends beyond the eyes. There are five tentacles and a pair of enormous eyes. The proboscis has a crown of small papillae and is devoid of lateral tentacle-like processes. There are five pairs of tentacular cirri. There are no undeveloped parapodia in the anterior region. The feet end in a single cirriform process. The dorsal and ventral cirri are foliaceous. The bristles are of two kinds: (1) short acicular bristles which may be simple or compound; (2) long, capillary compound swimming bristles. Segmental glands are present.

Callizona angelini (Kinberg).

Fauvel, 1923, p. 215, fig. 81 *d–i*.

Occurrence. St. 405 (1).

Specific characters. A rather large species recorded up to 120 mm. in length. The present anterior fragment measures 2 mm. in breadth without the feet. The five pairs of tentacular cirri are massive and arranged as follows: $1+\frac{1}{1}+\frac{1}{1}$. The imbricating dorsal cirri are cordiform anteriorly and more lanceolate farther back. The ventral cirri are oval or lanceolate. In the anterior feet the bristles are mostly rather short, stout and with a minute, slender end-piece; and with them there are a few slender spinigers. These are the extreme types and there is a tendency for one kind to grade into the other.

In the middle feet there are numerous, long, slender, compound swimming bristles and below these a single compound acicular bristle with a minute end-piece. Segmental glands are present from about the tenth foot backwards.

Genus Callizonella, Apstein

Body slender and elongate. The head, which extends beyond the two great eyes, carries five tentacles. The proboscis has a crown of small papillae. There are five pairs of tentacular cirri. There are no undeveloped feet behind the tentacular segments. The pedal lobe ends in a small cirriform appendage. The dorsal and ventral cirri are foliaceous. The bristles are of two kinds; long, delicate and capillary bristles and short and moderately stout bristles. The long capillary bristles are all simple, and the short acicular bristles may be either simple or compound. Segmental glands are present.

Callizonella bongraini (Gravier).

Callizona bongraini, Gravier, 1911, p. 70, pl. iv, figs. 39–43.
Benham, 1929, p. 189, pl. i, figs. 11–12.
Callizonella bongraini, Augener, 1929, p. 294, fig. 2 *a–g*.

Occurrence. St. WS 555 (3).

Specific characters. A small species measuring about 1 mm. in breadth and usually about 20 mm. in length. There are five pairs of tentacular cirri arranged as follows: $1+\frac{1}{1}+\frac{1}{1}$. The ventral cirrus of the third tentacular segment is foliaceous. The feet end in a small, inconspicuous terminal process, and the dorsal and ventral cirri are foliaceous, more or less ovate. In a normal foot from the mid-body there are about a dozen long, fine, simple capillary bristles and below these a single short, acicular bristle. In the first few feet the bristles are all short and compound. They are of two kinds, and their differences are analogous to the differences between the falcigers and spinigers of the Nereids, to which bristles they have a general resemblance. Whether the simple acicular bristles in the normal feet are compound bristles that have lost their end-pieces it is impossible to be certain, but I do not believe this to be the case.

Segmental glands are present on every foot behind about the tenth.

Genus Torrea, Quatrefages

Body cylindrical, transparent. The head does not extend beyond the eyes. Five tentacles, the median being reduced to a small tubercle. A pair of enormous spherical eyes. There are three pairs of tentacular cirri and the first two chaetigers are rudimentary. In the female their dorsal cirri are transformed into seminal pouches. The proboscis has a crown of papillae and a pair of lateral cirriform processes. The feet have foliaceous dorsal and ventral cirri. The pedal lobe is without any terminal appendage. The bristles are all long, compound, capillary swimming bristles. Segmental glands are present.

Torrea candida (Delle Chiaje).

Asterope candida, Fauvel, 1923, p. 202, fig. 75 *a–d*.

Occurrence. St. 714 (1).

Specific characters. The characters of this species are those of the genus. The present specimen is a small anterior fragment measuring 8 mm. by 1 mm. for 24 chaetigers.

Family TOMOPTERIDAE

Genus Tomopteris, Eschscholtz

The parapodial trunks, i.e. the dorsal and ventral divisions of the feet, are bordered all round by membranous wings or pinnules.

In *Tomopteris*, *sensu stricto*, a tail is almost always absent, and also, in the adult, the first pair of chaetigerous appendages. Hyaline glands are usually present; and there are no rosettes.

1.	There are no hyaline glands	*T. cavallii*
	Hyaline glands are present on the ventral pinnules	2
2.	Chromophil gland on a level with the tip of the ventral trunk	*T. septentrionalis*
	Chromophil gland below the ventral trunk	3
3.	A large species with the gonad in both rami of the feet	*T. carpenteri*
	A small species with the gonad in the dorsal ramus only	*T. planktonis*

Tomopteris (Tomopteris) carpenteri, Quatrefages.

Augener, 1929, p. 304.

Occurrence. St. 124 (1); 128 (1); 133 (6); 136 (2); 138 (3); 139 (6); 160 (1); 374 (16); 459 (2 juv.); 460 (1); 527 (24); 567 (16); 1148 (3); WS 22 (2); WS 26 (3); WS 35 (5); WS 38 (1); WS 39 (1); WS 45 (1); WS 53 (1); WS 53B (1); WS 54 (1); WS 55 (1); WS 536 (5); WS 541 (2); WS 544 (3); WS 545 (1); WS 547 (1); WS 548 (1); WS 549 (2).

Specific characters. A large species measuring up to 70 mm. in length for about 35 pairs of feet. The prostomium has no median notch. The neck is short and broad. The cerebral ganglion is transversely elongated and slightly bilobed. There is a single pair of black eyes, often invisible in the adult. The anterior pair of chaetigerous appendages is absent. The second pair is globular at the base and may reach back as far as three-fourths of the length of the body. The feet are conical, and the pinnules oval and rather long. The latter have their origin a short distance before the separation of the foot into its constituent rami. From the third foot backwards there is a conspicuous hyaline gland on the pinnule of the ventral ramus a little above and beyond the apex of the pedal trunk. From the fourth foot there is a very large chromophil gland lying below the apex of the pedal trunk in the ventral ramus. Genital products are found in both rami of the foot.

Remarks. It is noteworthy that out of all these specimens there is not one that I recognized as a female. I do not claim to have "sexed" every specimen carefully, but in the adult examples the foot usually contains a flocculent white substance which penetrates into both trunks after the division of the foot into its two rami. This substance appears to be sperm, and I have never seen any ova in the feet. In other species, e.g. in *septentrionalis*, ova are very conspicuous, and I think I should have seen them if they had been present in *carpenteri*.

Augener records *T. planktonis* from the Weddell Sea and suggests that previous authors have confused it with *carpenteri*, to which in the arrangement of the pedal glands it is very similar. It is distinguishable by its very much smaller size—it reaches

a length of only about 10 mm. for 18 pairs of feet—by the fact that in *carpenteri* the pinnules are wrinkled and continued much farther up the feet, and by the presence of genital products only in the dorsal ramus of the foot. In practice it is not easy to distinguish a young specimen of *carpenteri* from *planktonis*, of which I have not seen an example in the present collection from south of the Antarctic convergence.

Tomopteris (Tomopteris) planktonis, Apstein.

Fauvel, 1923, p. 224, fig. 84 *d*.
Augener, 1929, p. 303.

OCCURRENCE. St. 707 (4); 710 (1); 714 (4).

SPECIFIC CHARACTERS. Up to about 10 mm. in length for 18 pairs of feet. There is no prostomial notch. The neck is wide and short. The cerebral ganglion is transversely elongate and bilobed, and there is a pair of black eyes. The first pair of chaetigerous appendages is absent. The second pair may reach back for three-fourths of the length of the body. The pinnules of the feet are oval and rather short. They begin a little distal to the point where the foot forks into its two rami. From the fourth foot backwards there is a large, spherical chromophil gland on the under surface of the pinnule of the ventral ramus below the ventral trunk. There is also a small, indistinct hyaline gland lying a little above and distal to the tip of the trunk of the ventral ramus. The gonad lies in the dorsal ramus.

REMARKS. I have commented on the relation of this species to *T. carpenteri* under the heading of the latter species.

Tomopteris (Tomopteris) cavallii, Rosa.

Fauvel, 1923, p. 222, fig. 84 *a*.

OCCURRENCE. St. 451 (5).

SPECIFIC CHARACTERS. Up to about 12 mm. in length for 20 pairs of feet. The prostomium is deeply notched in front. The cerebral ganglion is transversely elongate, oval. There is a pair of brown eyes. The first pair of chaetigerous appendages is absent and the second may reach back for two-thirds of the length of the body. The rami of the feet are not widely separated and the pinnules are broad and rounded. There is a large chromophil gland from the fourth foot backwards, on the under side of the pinnule of the ventral ramus below the tip of the ventral trunk. There are no hyaline glands. The gonad is confined to the dorsal ramus of the foot.

REMARKS. I cannot discover a hyaline gland in these specimens. Except for this, they are difficult to separate from *T. planktonis*.

Tomopteris (Tomopteris) septentrionalis, Quatrefages, *ex* Steenstrup.

Fauvel, 1923, p. 224, fig. 84 *d*, with synonymy.
Monro, 1930, p. 86.

OCCURRENCE. St. 41 A (1); 100 C (12); 130 (1); 137 (2); 268 (10); 446 (15); 448 (4); 449 (7); 450 (25); 453 (20); 454 (4); 455 (3); 459 (5); 460 (8); 514 (25); 567 (26); 707 (3); 714 (4); 716 (2); 718 (6); WS 20 (2).

SPECIFIC CHARACTERS. Up to about 15 mm. in length with 23 pairs of feet. The prostomium has a slight anterior notch. The cerebral ganglion is oval and bilobed. There

is a pair of brown eyes. The neck is wide and short. The first chaetigerous appendage is absent and the second may be almost as long as the body.

From the fourth foot backwards there is a chromophil gland in the ventral pinnule lying just beyond the apex of the ventral trunk. This gland is very variable in size, and may occupy the whole distance from the tip of the trunk to the end of the pinnule, or it may be a comparatively small structure lying just inside the border of the pinnule. There is a small and often indistinct hyaline gland lying above and behind the chromophil gland. The ventral surface of the neuropodial pinnule is furnished with numerous, fine, parallel tubules which appear to open at the ventral border of the pinnule. These tubules stain very readily, and constitute a diffuse extension of the chromophil gland. The gonad lies in the dorsal ramus of the foot.

REMARKS. This is an eurythermic species inhabiting the cold and temperate waters of both hemispheres.

Family TYPHLOSCOLECIDAE

A large lobe above the brain (caruncle) ... ... *Travisiopsis*
Cerebral lobe indistinct ... ... *Sagitella*

Genus Sagitella, Wagner

Body cylindrical. Prostomium conical ending in a palpode. A lobe above the brain and paired nuchal organs. No vibratile cushions. The first three segments have each a single pair of foliaceous cirri, and the remaining segments have dorsal and ventral cirri. Bristles absent from the first few segments. The body ends in a pair of foliaceous anal cirri.

Sagitella lobifera, Ehlers (Fig. 16 *a*, *b*).

Ehlers, 1912, p. 24, pl. iii, figs. 1–4.
Monro, 1930, p. 90.

OCCURRENCE. St. 395 (11); 590 (3).

SPECIFIC CHARACTERS. Between 25 and 30 mm. in length by 3 mm. in breadth for 22 cirrigerous segments. The colour in spirit is pale yellow or pale green. In life it is deep scarlet. The head is a sharply tapering cone and ends in a filiform palpode (Fig. 16 *a*). There is a foliaceous cirrus on each side of the head and the following two segments have each only a single pair of cirri. As regards the nuchal organs, there is in the median line a single backwardly-directed tongue-shaped process, at the sides of which is a pair of backwardly-directed pinnate lobes about as long as the head. These pinnate lobes have up to five to six branches on each side of the main stem. Actually

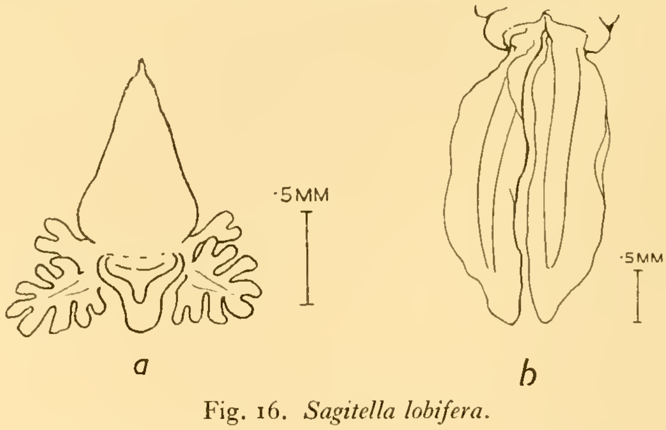

Fig. 16. *Sagitella lobifera*.
a. Head from above, cirri not shown. *b*. Anal cirri.

these lobes are not quite symmetrical, for on the outer and anterior edge of the main stem there are one or two small branches which are not represented on the opposite side of the stem. If they were present they would be covered by the median tongue-shaped process.

Behind the first three segments there are paired dorsal and ventral cirri in each segment. In the present specimens the cirri are either lost or too much damaged for examination. Ehlers figures them as heart-shaped. The bristles begin at the sixth to seventh segment. The foot consists of an aciculum surrounded by a cylindrical sheath, beyond which the tip protrudes, and two or three simple bristles with curved ends. At the end of the body there is a pair of long, more or less oval, transparent anal cirri (Fig. 16 *b*) supported by a central hyaline process.

Remarks. Both the hauls from which these specimens were taken were made below the 1000-m. line, and St. 395 yielded 11 specimens taken in a single haul at a depth of between 1500 and 1600 m. Augener (1929, p. 309) conjectures that this species is identical with *S. cornuta*, Ehlers. I do not agree with this, for *S. cornuta* has much simpler nuchal organs.

Genus Travisiopsis, Levinsen

There are no vibratile cushions. Above the brain there is a pad flanked on either side by the nuchal organs.

Travisiopsis benhami, n.sp. (Fig. 17 *a–c*).

Sagitella kowalewskii, Gravier, 1911, p. 74, pl. iii, figs. 30–32.
Ehlers, 1913, p. 526, pl. xxxix, fig. 15.
Benham, 1927, p. 80, pl. ii, figs. 33–34.
Monro, 1930, p. 89.
Nec Sagitella kowalewskii, Wagner.

Occurrence. St. 151 (1); 575 (1); 588 (1); WS 351 (1); WS 549 (1); WS 555 (2).

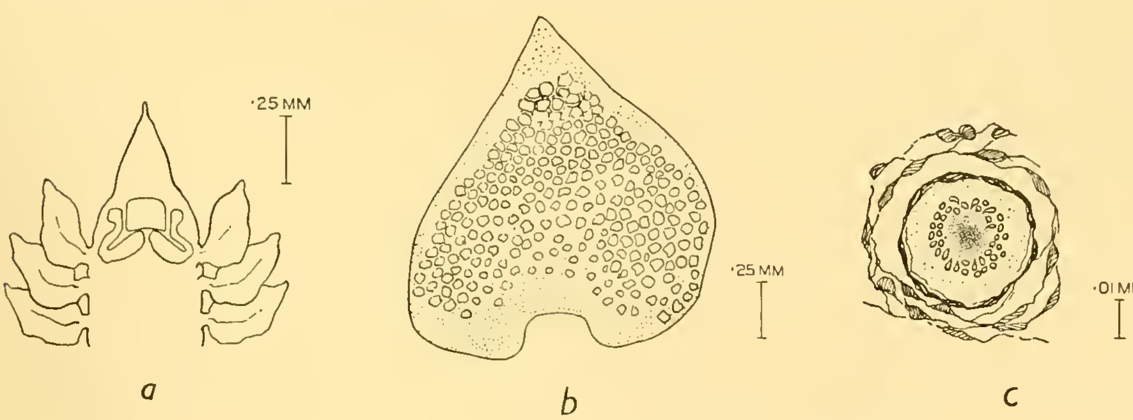

Fig. 17. *Travisiopsis benhami*.
a. Head from above. *b*. Cirrus. *c*. Sieve-cell.

Specific characters. Up to about 25 mm. in length for 25 cirrigerous segments. The head (Fig. 17 *a*) is conical and ends in a small palpode. It is followed by three short segments each bearing a single pair of foliaceous cirri. The remaining segments carry paired dorsal and ventral cirri. Above the cerebral ganglia there is a transversely

elongated, rectangular caruncle on each side of which the nuchal organs form a rounded lobe. These nuchal lobes are connected by a narrow neck at the sides of the head with paired semicircular nuchal processes lying at the outer and hinder angles of the caruncle. This condition is somewhat like that in *T. lobifera* except that the nuchal organs do not curve round in front of the caruncle. The everted proboscis is conical and about as long as the head.

The cirri (Fig. 17 *b*) in the mid-body have a very wide basal insertion. They are broadly triangular and their whole surface is a mass of rounded sieve cells (*cellules en tamis*) (Fig. 17 *c*). Towards the end of the body the cirri gradually lengthen out and become narrowly lanceolate. The bristles begin on the 12th–13th cirrigerous segment. They are simple, acicular bristles usually two in number in each foot and are separated by an aciculum, the point of which projects beyond the end of its sheath. At the end of the body there is a sort of tail fan, consisting of a pair of elongate, oval, anal cirri, each supported down the middle by a kind of hyaline process.

Remarks. I have examined Benham's example from the Ross Sea, and although it is small and rather ill-preserved I believe it to be conspecific with these specimens. Gravier and Benham, working on poor material, have both in my opinion failed to interpret the structure of the nuchal organs and did not see the connection between the lateral and posterior nuchal lobes. The nuchal organs and caruncle in the present species are more those of a *Travisiopsis* than of a *Sagitella*. I have compared these specimens with an example of Wagner's *S. kowalewskii* from Madeira, and in my opinion it is a different species. The structure of the nuchal organs with the narrow connection between the anterior and posterior lobes is unlike that of any other *Travisiopsis*.

Family SYLLIDAE

1.	No ventral cirri ...	*Autolytus*
	With ventral cirri...	2
2.	Dorsal cirri moniliform. Palps separate	3
	Dorsal cirri unsegmented. Palps fused at their base ...	4
3.	Body long, flat and ribbon-like ...	*Trypanosyllis*
	Body short and subcylindrical ...	*Syllis*
4.	Rim of pharynx smooth ...	*Pionosyllis*
	Rim of pharynx denticulated ...	5
5.	With a coiled pharynx. Nuchal epaulettes present ...	*Amblyosyllis*
	Pharynx straight. No nuchal epaulettes	*Eusyllis*

Genus Syllis, Savigny

The palps are separate, not fused. The tentacles and dorsal cirri are moniliform. There is a single anterior pharyngeal tooth and the pharynx has a crown of soft papillae. The bristles are compound, with heterogomph unidentate or bidentate blades.

1.	Bristles unidentate	*Syllis prolixa*
	Bristles bidentate	2
2.	Articulation between chaetal blade and shaft obscure. Dorsal cirri long and slender ...	*S. sclerolaema*
	Articulation between chaetal blade and shaft obvious. Dorsal cirri short and spindle-shaped ...	*S. brachychaeta*

Syllis prolixa, Ehlers.

Ehlers, 1901, p. 92, pl. ix, figs. 1–7.
Monro, 1930, p. 100, fig. 32.
Syllis longifilis, Ehlers, 1901, p. 95, pl. x, fig. 3.

OCCURRENCE. St. 53 (numerous).

SPECIFIC CHARACTERS. Up to about 10 mm. in length. The back is marked by transverse brown bands. There is one band at each intersegment and another, widely interrupted in the median line, in the middle of each segment. The head is broader than long and there are two pairs of eyes. The pharyngeal tooth is terminal; and the pharynx extends to the 12th chaetiger and the proventriculus to the 22nd. The longer dorsal cirri have about 50 articles. The bristles are unidentate.

REMARKS. This species is very close to *Syllis vittata*, Grube.

Syllis sclerolaema, Ehlers.

Ehlers, 1901, p. 86, pl. x, figs. 1–2.
Monro, 1930, p. 102, fig. 35.

OCCURRENCE. St. WS 85 (7); WS 244 (1); WS 246 (2); WS 762 (2); WS 771 (numerous); WS 773 (4); WS 782 (4); WS 856 (2).

SPECIFIC CHARACTERS. Up to about 35 mm. in length. The head is very short, twice as broad as long. There are two pairs of minute eyes, the anterior larger than the hinder. The palps are very broad at the base. The pharynx extends to the 15th chaetiger and the proventriculus to the 22nd. There is a terminal tooth and a circlet of 10 papillae.

The dorsal cirri are inserted rather high up above the foot and the longer have about 40 articles. The difference between the longer and shorter dorsal cirri is not marked. There is a large and tapering ventral cirrus.

The foot is rounded in outline and has two unequal lips. It is supported by two or three acicula and carries a number of bristles, broad at the head of the shaft and with the articulation between blade and shaft obscure. The blade has the appearance of an uninterrupted continuation of the shaft (pseudoypsiloid) and ends in a bidentate hook.

Syllis brachychaeta, Schmarda.

Augener, 1918, p. 247, pl. iv, figs. 83–85; pl. v, fig. 98; text-fig. 20.
Benham, 1927, p. 55.

OCCURRENCE. St. 190 (2).

SPECIFIC CHARACTERS. Up to about 30 mm. in length. The head is transversely oval and there are two pairs of eyes. The tooth lies in the front of the pharynx which extends to about the 10th chaetiger; the proventriculus reaches to about the 18th. The short dorsal cirri have a characteristic spindle-shaped appearance and are composed of about 12 articles. The bristles have rather short bidentate blades.

Genus Trypanosyllis, Claparède

Body flattened and ribbon-like. Palps clearly separated. Dorsal cirri moniliform. Pharynx with a crown of teeth and a single anterior tooth. Reproduction by stolons.

Bristles unidentate. Body colourless ... ... *T. gigantea*
Bristles bidentate. Body striped ... ... *T. taeniaeformis*

Trypanosyllis gigantea (McIntosh) (Fig. 18).

Syllis gigantea, McIntosh, 1885, p. 193, pl. xxx, figs. 1–3; pl. xxxiii, fig. 4; pl. xA, fig. 14; pl. xxivA, fig. 7.
Trypanosyllis gigantea, Ehlers, 1901, p. 85, pl. vi, figs. 11–16.
Benham, 1927, p. 56, pl. i, fig. 1.

Occurrence. St. 652 (1); WS 85 (1); WS 225 (11); WS 228 (1); WS 244 (2); WS 246 (3); WS 248 (3); WS 249 (1); WS 783 (1); WS 785 (2); WS 803 (2); WS 804 (2); WS 825 (1); WS 847 (1); WS 877 (1).

Specific characters. A large flattened, ribbon-like species measuring up to 200 mm. in length. There are no colour markings except on the longer dorsal cirri, which are lilac. The head is bilobed and deeply incised behind. There are two pairs of large eyes. The median tentacle is about four times as long as the head, and the laterals about two-thirds of this. The dorsal tentacular cirrus is about a third as long again as the median tentacle and the ventral tentacular cirrus about one-half of this. The pharynx is thickly lined with chitin and has a crown of about 12 teeth, and also a single terminal pharyngeal tooth. This crown is surrounded by a circlet of 10 large papillae. In the anterior and posterior regions the longer of the alternating dorsal cirri are about two-thirds as long as the body is broad, and in the middle region they are equal to about half the breadth of the body. The shorter dorsal cirri are about two-thirds of the length of the longer. The feet are more or less lanceolate and are supported by three or four acicula. The bristles are unidentate. The ventral cirri are conical.

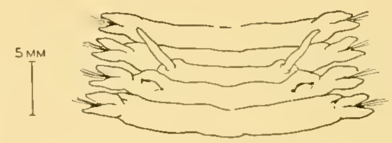

Fig. 18. *Trypanosyllis gigantea*. Ventral view of head of stolon.

Remarks. Two examples collected in September 1928 are in the "chain" phase. As in *T. zebra*, observed from the dorsal surface the stock and the stolons appear to be in complete continuity, and stolonization can be detected only from the ventral surface.

The two specimens exhibit different stages in stolonization, an earlier and a later. In the earlier stage the stolons, of which there are five, begin at the 200th segment. All that can be seen is on the ventral side a very narrow transverse ridge of tissue, with a pair of rudimentary tentacles at its outer edges, interrupting the continuity of the segments. The stolons have about 25 chaetigers. At this early stage I find it difficult, without sectioning, to discover the sex of these buds. I have seen no eggs. A little later stage (Fig. 18) is represented by the greater development of the pair of tentacles and by the appearance of a pair of eyes below the ventral cirri of the segment following the transverse ridge of tissue. In this specimen the stolons begin at the 290th chaetiger, and have 18 segments. Here again I can see no eggs.

Benham (*loc. cit.*) gives an account of a stolon at a much later stage.

Fauvel suggests that *T. gigantea* may be a giant form of *T. zebra.* I have had a lot of material of McIntosh's species through my hands, and I confess that I have seen nothing that leads me to support Fauvel's view.

Trypanosyllis taeniaeformis (Haswell) (Fig. 19).

Augener, 1913, p. 230, and 1924, p. 374.
Monro, 1933, p. 35.

OCCURRENCE. St. 929, New Zealand (2).

SPECIFIC CHARACTERS. A smaller species than *T. gigantea.* The larger specimen measures 45 mm. by 2 mm. for 183 chaetigers. There is a pair of orange brown, transverse, equal bands in each segment for about the anterior third of the body. The head is bilobed, slightly incised behind. There are two pairs of large eyes. The median tentacle is about three times as long as the head and the laterals two-thirds of this. Upper tentacular cirrus about a third as long again as the median tentacle and the lower about half this. The dorsal cirri are alternating and have a violet colour. The longer are about equal to the breadth of the body, and the shorter about two-thirds of this. The pharynx has a crown of about 10 teeth surrounded by a circlet of 12 papillae. The bristles are bidentate.

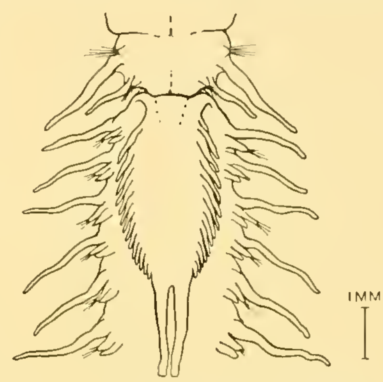

Fig. 19. *Trypanosyllis taeniaeformis.* Ventral view of beginning of stolon.

One of these specimens is in the chain phase. The stolon is not budded off from the last segment of the stock, but comes off from the 183rd chaetiger and leaves the tail-end of the stock folded underneath the ventral surface (Fig. 19). I cannot count the number of segments in this tail piece, but it is equal in length to the five preceding chaetigers. The stolon is clearly marked off both dorsally and ventrally from the stock. It is a female bud filled with eggs and has 35 chaetigers. There are no swimming bristles and apparently no ventral cirri. I cannot see a trace of cephalization.

REMARKS. The specimens from Gorgona Island attributed by me to this species have smaller and more numerous papillae at the mouth of the pharynx, but I find them otherwise indistinguishable.

I believe this to be the first record of this species from New Zealand, where its place is usually taken by *T. picta*, Kinberg. The latter species is readily distinguishable by the presence of a large nuchal flap or gibbosity.

Genus **Pionosyllis**, Malmgren

Palps fused at the base. Tentacles and cirri smooth, non-moniliform. A single, anterior, pharyngeal tooth. The rim of the pharynx is smooth. Reproduction direct.

Anterior dorsal cirri very long	*P. comosa*
Anterior dorsal cirri short. Embryos carried on the back of the female ...	*P. nutrix*

Pionosyllis comosa, Gravier (Fig. 20).

Gravier, 1907, p. 15, pl. ii, figs. 12–13.
Benham, 1921, p. 22.

Occurrence. St. 929, New Zealand (4).

Specific characters. I have some hesitation in attributing these New Zealand specimens to Gravier's Antarctic species. They are all fragmentary and the largest measures 24 mm. by 2 mm. for 43 chaetigers. The body is dorsally arched, and in spirit there are no colour-markings. The head (Fig. 20) is about $1\frac{1}{2}$ times as long as broad. It is produced backwards into two long lobes divided by a deep median cleft, and behind the head there is a low nuchal collar. There are two pairs of orange-coloured eyes. The palps are fused at their base and the median tentacle is about three times as long as the head. The laterals are about two-thirds of this. There are two pairs of tentacular cirri In the anterior region the dorsal cirri are very long, being equal to the length of about 12 segments in the front region. Over the rest of the body they are rather longer than the body is broad. The pharynx extends to the 13th chaetiger and the proventriculus to the 22nd. There is a single anterior tooth and the mouth of the pharynx appears to be quite smooth; there is a circle of papillae around the pharyngeal rim.

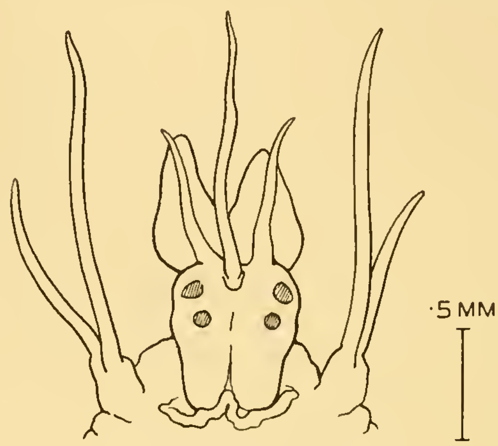

Fig. 20. *Pionosyllis comosa.* Head from above.

The feet are rounded in outline and are supported by three curious acicula with blunt tips that are curved at the end. The bristles have stout denticulated and bidentate end-pieces, longer in the upper part of the foot than in the lower. The ventral cirri are rather stout, more or less conical structures, about as long as the feet.

One of the specimens is an epitocous female with swimming bristles beginning at the 19th chaetiger. The posterior region in all these examples is lacking, and I have seen no simple bristles.

Remarks. I have compared these specimens with an example from South Georgia, and except for the great backward prolongation of the head I can find no ground for separation.

The shape of the head may be, to some extent at least, the result of post-mortem distortion. Moreover, Ehlers has attributed to this species some specimens in which the posterior cleft of the head is apparently entirely absent (Ehlers, 1913, p. 473). From this it would appear that the shape of the head, at any rate in preserved specimens, is subject to considerable variation.

Pionosyllis nutrix, n.sp. (Fig. 21 *a–d*).

Occurrence. St. WS 564 (12).

Specific characters. A small species measuring about 12 mm. in length for between 50 and 60 chaetigers. In spirit there is no colour. The head (Fig. 21 *a*) is broader than long and rounded in front. There are two pairs of eyes. The tentacles, tentacular cirri and the dorsal cirri throughout the body are all very similar in shape and size. They are simple, subulate structures, somewhat thickened basally and tapering to a point, and their size is about equal to half the breadth of the body. The ventral tentacular cirri are a little smaller than the rest.

The pharynx extends to about the 4th chaetiger and the proventriculus to the 10th. The pharyngeal tooth is anterior and the mouth of the pharynx is smooth and surrounded by a circlet of 10 papillae. The feet (Fig. 21 *b*) are more or less triangular in outline and supported by three acicula. The bristles are all bidentate and the end-pieces have a characteristic aspect, for the denticulations show a great increase in size from above downwards (Fig. 21 *c*). The ventral cirri are small and conical and scarcely reach to the end of the foot. There is a pair of pygidial cirri resembling the normal dorsal cirri.

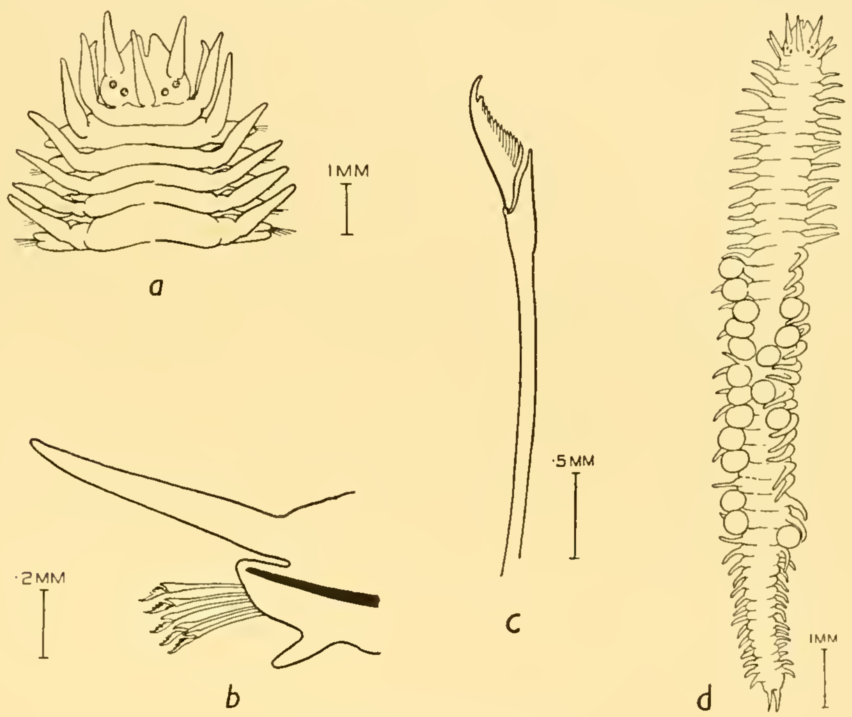

Fig. 21. *Pionosyllis nutrix.*
a. Head from above. *c*. Bristle.
b. Middle foot. *d*. Dorsal view.

A number of these specimens carry developing eggs on their backs (Fig. 21 *d*), the embryos being arranged in pairs, one pair to each segment.

Remarks. This species is at once separable from the other southern members of the genus, *P. comosa*, Gravier, *P. maxima*, mihi, and *P. stylifera*, Ehlers, by the structure of the dorsal cirri and the bristles.

This is the first record of a *Pionosyllis* from southern waters carrying its embryos on its back.

Genus **Eusyllis**, Malmgren

Palps fused at the base. Tentacles and dorsal cirri smooth, but often appearing to have annulations. The rim of the pharynx is denticulated and there is also a single, anterior, pharyngeal tooth. Two rows of papillae round the mouth of the pharynx. The body is very fragile.

Eusyllis kerguelensis, McIntosh.

McIntosh, 1885, p. 191, pl. xxix, fig. 4; pl. xxxiii, fig. 3; pl. XVA, fig. 13.
Gravier, 1907, p. 17, pl. ii, figs. 14–16.
Monro, 1930, p. 94, fig. 30 *a–c*.

Occurrence. St. 53 (1); 190 (2); WS 811 (2); WS 836 (3); WS 837 (1); WS 856 (1).

Specific characters. A massive species having the body dorsally arched. The head is rather broader than long, with two pairs of eyes between which run a pair of transverse prostomial ridges separated by the median tentacle. The head is deeply incised behind. The median tentacle is longer than the laterals. Tentacles and cirri are smooth.

The dorsal cirri are extremely long and the top of the foot is provided with a small languet. The two or three uppermost bristles in every foot have very long and slender bidentate end-pieces. The rest of the bristles have relatively short and broad end-pieces, also bidentate. The ventral cirri are broad and triangular.

The pharynx carries in addition to a single large terminal tooth a crown of nine chitinous teeth. This crown is encircled by a band of nine large papillae, behind which is a second band of nine flattened, semicircular papillae.

Remarks. This species is very fragile and all my specimens are fragmentary.

Genus **Amblyosyllis**, Grube

Body short, composed of trapeziform segments with deep intersegmental constrictions. The palps are fused at their base. There is a pair of nuchal epaulettes. The pharynx is long and coiled and armed with a circlet of teeth. The tentacles and dorsal cirri are pseudo-moniliform. The penultimate segment is achaetous.

Amblyosyllis granosa, Ehlers.

Ehlers, 1897, p. 58, pl. iii, figs. 73–76.
Augener, 1913, p. 243, and 1923, p. 389.

Occurrence. St. 929, New Zealand (1); WS 33 (1).

Specific characters. From New Zealand there is a single somewhat ill-preserved specimen measuring 13 mm. in length for 15 segments of which 13 are chaetigers. The ground colour is pale yellow and there are here and there on the dorsum traces of what was probably dark transverse striping. In addition the dorsal surface is dotted with numerous small dark specks. The head is rounded and there are two pairs of large orange-coloured eyes and a pair of long digitiform nuchal organs pointing outwards. The palps are turned down underneath the head. The median tentacle is longer than the laterals. They and the very long dorsal cirri are apparently moniliform. The ventral

cirri are subulate and slightly longer than the feet. The bristles have long pectinate and bidentate end-pieces.

REMARKS. This specimen is larger than any hitherto recorded and the dorsal markings rather different. Nevertheless I believe it to belong to Ehlers' species. According to Ehlers the pharynx is very much coiled and there are no pharyngeal teeth. Augener has recorded this species from Shark's Bay.

The specimen from South Georgia may well belong to a different species, but with the material at my disposal I do not feel justified in making a separation. It measures 10 mm. for an equal number of chaetigers and is quite colourless. Moreover, the general aspect is rather different. The intersegmental constrictions are not so deep and the body is less fragile. Furthermore, the long tentacles and dorsal cirri are quite smooth and have no trace of the constrictions present in the New Zealand specimen and figured by Ehlers for *A. granosa*. The eyes, too, are of a darker red than in the New Zealand specimen, and the bidentate blades of the bristles are relatively longer and narrower. I have not been able to examine the pharynx, etc.

As far as external characters go, I can find nothing very definite to separate the two specimens.

Ehlers' *A. infuscata* from Juan Fernandez has no visible nuchal organs and has long slender ventral cirri quite different from the stout, asymmetrical ventral cirri of the present specimens.

Genus Autolytus, Grube

The palps are fused and have moved down to the ventral surface of the head. They are coalescent. Tentacles and dorsal cirri unsegmented. There are no ventral cirri. The pharynx is more or less coiled and usually has a crown of teeth. The end-pieces of the bristles extremely small, rudimentary. Reproduction by stolons, which differ from the stock and are sexually dimorphic. The male (*Polybostrichus*) has bifid palps, three tentacles, one or two pairs of tentacular cirri, and swimming bristles in a number of segments. The female (*Saccouereis*) has no palps, three tentacles, one or two pairs of tentacular cirri, swimming bristles, and carries her eggs in a large sac attached to the ventral surface.

With large nuchal epaulettes ... ... *A. charcoti*
Nuchal organs not apparent ... ... *A. simplex*

Autolytus charcoti, Gravier (Fig. 22).

Gravier, 1907, p. 7, pl. i, figs. 1–2.
Benham, 1921, p. 27, pl. v, figs. 7–10.
Monro, 1930, p. 97.

OCCURRENCE. St. 42 (1); WS 27 (2); WS 228 (1).

SPECIFIC CHARACTERS. All these specimens are in rather poor condition. That from St. 42 was preserved in a membranous tube entangled in the branches of a hydroid. The largest measures 24 mm. by 3 mm. for between 90 and 100 chaetigers. The body is marked by reddish brown transverse segmental bands, and in some specimens the dorsal cirri also partly have this colour. The head is broader than long and has two pairs

of eyes. There is a characteristic pair of divergent nuchal epaulettes reaching back to the 3rd chaetiger. The tentacles and tentacular cirri are long and unconstricted. The normal dorsal cirri are about half as long as the body is broad. According to Benham the pharynx extends back to the 7th chaetiger, where it bends forward on itself, and turns back to enter the proventriculus, which occupies segments 10–14.

The pedal lobes form large, rounded prominences above the bristles, and glandular pads are present on the ventral surface.

The bristles are bidentate and have the head of the shaft denticulated. Gravier states that there is also in each foot a single, simple capillary bristle. These I have not seen.

Sacconereis

The specimen from St. WS 228 is a ripe female measuring 18 mm. by 1 mm. for about 70 chaetigers. There are swimming bristles from the 15th to the 35th chaetigers, and the anterior pair of eyes is greatly enlarged, so as to extend down the sides of the head to the ventral surface. Otherwise it is not modified.

Polybostrichus

The specimen from St. 42 is a ripe male beginning to turn into a *Polybostrichus*. Only the head shows signs of modification. The normal eyes have disappeared and their place is taken by a single pair of dark eyes rather deeply embedded in the sides of the head. The anterior pair of appendages shows signs of forking towards its base, or to be more exact, a pair of stout conical lobes appear to have grown out from the head at the point of insertion of the lateral tentacles and to have carried the latter with them attached to the bottom of their outer faces (Fig. 22). In the light of the controversy as to the homology of the anterior bifid appendages in *Polybostrichus* it may be worth remarking that the true palps do not seem to be involved in this process at all. Behind these bifid appendages there is a pair of small, rounded lobes which I take to be rudiments of lateral tentacles. The body colour is more intense than in any atocous specimen that I have seen.

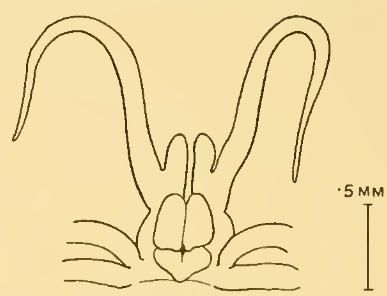

Fig. 22. *Autolytus charcoti* (*Polybostrichus*). Ventral view of head showing palps and forking of lateral tentacles.

REMARKS. Of the southern cold-water species *A. simplex*, Ehlers, *A. gibber*, Ehlers, *A. maclearanus*, McIntosh, and *A. charcoti*, Gravier, the last is the only one with nuchal epaulettes.

Autolytus simplex, Ehlers.

Ehlers, 1901, p. 97, pl. x, figs. 5–8.
Fauvel, 1916, p. 430.
Monro, 1930, p. 97.

OCCURRENCE. St. 53 (numerous).

SPECIFIC CHARACTERS. A very large number of examples of this small species were obtained from washings from Hydroid and Mytilus clumps. The size is up to about

10 mm. in length. In some specimens traces of longitudinal dark markings are visible on each side of the body just above the feet. The head is rounded and the two pairs of eyes are almost contiguous. The tentacles, tentacular cirri and the dorsal cirrus of the 1st chaetiger are all very long and indistinctly annulated. The normal dorsal cirri are smooth, short and stumpy, and are equal in length to about half the breadth of the body. The pharynx extends to about the 8th chaetiger and the proventriculus to about the 12th. The pharynx appears to be unarmed and runs past the mouth of the proventriculus, looping back to enter it. The bristles are clearly bidentate with a very well-developed second tooth, so much so that the second tooth is as large as, if not larger than the apical tooth.

Bayonet bristles are present, but only discoverable under a very high magnification.

Polybostrichus

Among these specimens there was a single ripe male. It measures about 4 mm. in length for 28 chaetigers, of which the first six are unmodified. The head is round and deeply notched in front and the rather slender bifid palps are turned backwards at the sides in a manner that recalls the anterior tentacles of the Tomopterids. There are two pairs of red eyes, a dorsal and a ventral, the ventral being considerably the larger. Behind the dorsal eyes there is a minute pair of lateral tentacles. The median tentacle is about the same length as the palps and reaches back to about the 10th chaetiger. The dorsal tentacular cirri are very long and the single remaining ventral tentacular cirrus is a very slender filiform process about as long as the body is broad. All the modified segments bear long swimming bristles.

Polybostrichus sp.? (Fig. 23).

Occurrence. St. WS 832 (1).

Description. The specimen measures 9 mm. by 1 mm. for 64 chaetigers, of which the first 14 and the last 20 are unmodified. The colour is a pale brown and the head appendages are white except for the median tentacle and the dorsal cirri of the 1st chaetiger, which are also brown but paler than the body. The head is rather longer than broad and the very wide, flattened proximal areas of the modified, bifid palps are in contact at their base. There are the usual two pairs of large eyes, a dorsal and a ventral. At the inner and hinder corners of the dorsal eyes is a pair of small, slender lateral tentacles, and behind these medially is a large, stout median tentacle reaching back to the end of the anterior unmodified region. Squeezed in at the sides between the head and the 1st chaetiger, there are two pairs of slender tentacular cirri, the dorsal about twice the length of the ventral. The dorsal cirri of the 1st chaetiger are relatively enormous and reach back to about the 20th chaetiger. The dorsal cirri of the following three or four chaetigers are much smaller and equal in length the dorsal tentacular

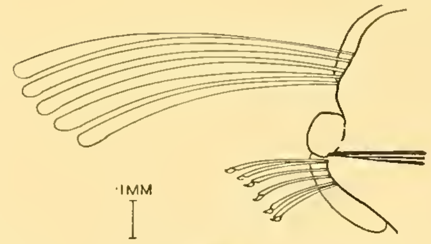

Fig. 23. *Polybostrichus* sp. Foot with swimming bristles; dorsal cirrus omitted.

cirrus. The normal dorsal cirri are about half as long as the body is broad. All the modified segments carry swimming bristles (Fig. 23). There is a large rounded suprachaetal lobe.

Otherwise there is nothing remarkable about the normal feet and bristles. The bristles are of the usual type, with the heads of the shafts denticulated and with the end-pieces very short and clearly bidentate.

REMARKS. I suspect this specimen of being the *Polybostrichus* of *Autolytus gibber*, Ehlers. It is clearly different from the *Polybostrichus* of *A. simplex* which is represented in the present collection. Nuchal epaulettes are present in the *Polybostrichus* of *A. charcoti*, and according to Ehlers (1913, p. 490) the *Polybostrichus* of *A. maclearanus* has a very differently shaped head with the median tentacle set in front of the dorsal eyes. The *Polybostrichus* of *A. longstaffi*, Ehlers, of which the atocous form is not known, has a head rather like that of the present specimen, but in the anterior region only the first six instead of the first 14 chaetigers remain unmodified. *Autolytus gibber*, Ehlers, is the only other *Autolytus* described from these waters, and it seems a probable assumption that the present specimen belongs to that species.

Family NEREIDAE

1.	Without paragnaths	*Leptonereis*
	With paragnaths	2
2.	Horny paragnaths arranged in pectinate rows...	*Platynereis*
	Horny paragnaths conical and separated	*Nereis*

Genus Nereis, Cuvier

Body elongate and vermiform. Two ovoid palps, two tentacles and four pairs of tentacular cirri. Proboscis with separate, conical, horny paragnaths usually arranged in distinct groups. The feet are biramous. The bristles are compound and the end-pieces are either long, sharply pointed processes (spinigers) or relatively short, more or less curved blades (falcigers).

1.	Without paragnaths on the maxillary ring ... (Subgenus *Eunereis*)	*N.* (*Eunereis*) *hardyi*
	With paragnaths on the maxillary ring...	2
2.	With homogomph falcigers in the notopods of the hinder region	3
	Without homogomph falcigers in the notopods of the hinder region	4
3.	Hinder notopodial falcigers bidentate or tridentate	*N. jacksoni*
	Hinder notopodial falcigers with simple, blunt tips	*N. eugeniae*
4.	Paragnaths of oral ring in a single row...	*N. kerguelensis*
	Paragnaths of oral ring in several rows...	5
5.	Paragnaths of oral ring a continuous band; three notopodial languets ...	*N. cricognatha*
	Paragnaths of oral ring discontinuous; two notopodial languets	*N. callaoana*

Nereis (Eunereis) hardyi, Monro.

Monro, 1930, p. 109, fig. 39 *a–d*.

OCCURRENCE. St. WS 755 (2); WS 756 (1); WS 797 (10); WS 811 (2); WS 834 (numerous); WS 841 (1); WS 847 (3); WS 848 (10).

Specific characters. Size up to about 130 mm. by 5 mm. without the feet for 85 chaetigers. There are very distinct reddish brown markings on the head and back and the pedal glands are brown. There are no paragnaths on the maxillary ring. On the oral ring there is a pair of paragnaths side by side on group V. There is none on group VI. Groups VII and VIII consist of a single row of seven or eight rather large, widely spaced paragnaths.

In the anterior region the notopod has two conical dorsal languets of about the same size, between which is a third very small languet in contact with the bristles. The neuropodial chaeta-sac has two unequal lips, the anterior rounded and the posterior longer and conical. The ventral languet is broader and blunter than those of the dorsal branch. The dorsal cirrus extends for about half its length beyond the end of the upper dorsal languet, and the ventral cirrus is the same length as the ventral languet. In the hinder region the intermediate dorsal languet disappears: otherwise there is very little change. The dorsal bristle bundle contains homogomph spinigers, the upper ventral bundle homogomph spinigers and heterogomph falcigers and the lower ventral bundle a single heterogomph spiniger and heterogomph falcigers.

St. WS 756 yielded an epitocous female with the modified region beginning at the 20th chaetiger.

Nereis cricognatha, Ehlers.

Ehlers, 1904, p. 29, pl. iv, figs. 3–7.
Augener, 1913, p. 163; and 1924, p. 334.

Occurrence. St. 929, New Zealand (2).

Specific characters. The larger specimen measures 70 mm. by 4 mm. for 60 chaetigers. The paragnaths have the following arrangement: (I) a square or lozenge shaped cluster; (II) an oblique, subtriangular band; (III) a transverse cluster; (IV) more or less triangular patches; (V), (VI), (VII) and (VIII) form an uninterrupted band of paragnaths about eight or nine deep. The dorsal ramus of the foot has three languets, of which the uppermost is considerably larger than the rest: it is triangular and with a very broad base. The intermediate is small, pointed and conical, and the lower languet is a little narrower and smaller than the upper. The dorsal cirrus is short and does not reach to the end of the upper languet.

The ventral ramus has a chaetal lobe with two rather unequal lips, a ventral languet of about the same length and a minute ventral cirrus set far back on the foot. In the hinder region the upper dorsal languet increases a little in size relatively to the lower, but it does not become either swollen or foliaceous.

The heterogomph falcigers have all rather long, knife-like blades with a hooked tip. I can see no heterogomph spinigers. The similarity of the present species to *N. caudata* has already been pointed out.

Nereis callaoana, Grube.

Nereis angusta, Kinberg, 1857, p. 51, pl. xx, fig. 2.
Nereis callaoana, Augener, 1918, p. 184, with synonymy.

Occurrence. St. 399, Gough Island (7).

Specific characters. The largest specimen measures about 33 mm. in length for about 70 chaetigers: Augener records a specimen measuring 60 mm. in length for 87 chaetigers. The arrangement of the paragnaths is as follows: (I) one, or two or three in a longitudinal row; (II) rather small curved clusters; (III) a transverse cluster; (IV) curved clusters; (V) none or one; (VI) a pair of small usually cruciform patches; (VII) and (VIII) a somewhat irregular band of two or three rows.

In the notopods there is a pair of conical, subequal languets and a long dorsal cirrus extending for more than half its length beyond the foot. The ventral ramus has a blunt ventral languet and a short ventral cirrus. In the hinder region the languets are more slender and pointed. I find nothing distinctive in the bristles.

Remarks. This species has been recorded from Chile and Peru, and from West Africa and the Cape. It is therefore not surprising to find it at Gough Island.

Nereis jacksoni, Kinberg.

Fauvel, 1932, p. 97, with synonymy.

Occurrence. St. 929, New Zealand (10).

Specific characters. Body very slender and elongate. There is no notch between the prostomial tentacles. The paragnaths are arranged as follows: (I) none; (II) curved rows; (III) a transverse patch; (IV) crescentic patches; (V) none; (VI) on each side a small group of minute paragnaths; (VII) and (VIII) a single row of about seven widely spaced paragnaths.

In the feet the dorsal ramus has two conical languets and a dorsal cirrus longer than the foot. The ventral chaetal lobe is rounded and there is a large blunt ventral languet. In the hinder region the dorsal languet is much reduced.

The ventral heterogomph falcigers have curved and ciliated end-pieces. In the middle and posterior regions the notopod carries one or two homogomph falcigers with bidentate or tridentate end-pieces.

Remarks. The relation of this species to *N. kauderni* is discussed by Fauvel (*loc. cit.*). It seems to me that the grounds for separation are very slender.

Nereis eugeniae (Kinberg).

Ehlers, 1897, p. 67, pl. iv, figs. 94–105.
Monro, 1930, p. 104.

Occurrence. St. 652 (2); WS 583 (10); WS 796 (2); WS 811 (10); WS 824 (1); WS 834 (10); WS 866 (4).

Specific characters. Size up to about 170 mm. by 3 mm. without the feet for 125 chaetigers. The eyes are not very distinct. The arrangement of the paragnaths is as follows: (I) none; (II) a small subtriangular patch; (III) absent, or a few sparse paragnaths; (IV) an oblique distichous mass; (V) none or one; (VI) on each side a small patch of three or four paragnaths; (VII) and (VIII) either absent or a single sparse rather irregular row.

In the anterior region the dorsal ramus of the foot has a pair of triangular languets, the upper longer than the lower, and a very small chaetal lobe. The ventral ramus has a

rather large chaetal lobe with rounded lips and a blunt ventral languet. The dorsal cirrus is considerably longer than the dorsal languet and the ventral cirrus is about the same length as the ventral languet. In the hinder region the languets are more elongate and narrower.

The dorsal bristle bundle in the anterior region has homogomph spinigers; the upper ventral bundle has homogomph spinigers and heterogomph falcigers, and the lower ventral bundle has heterogomph spinigers and heterogomph falcigers. In the hinder region the homogomph spinigers of the notopodium disappear and their place is taken by two or three homogomph falcigers with very short, blunt end-pieces.

St. WS 834 yielded an epitocous male with the modified region beginning at the 32nd chaetiger.

Nereis kerguelensis, McIntosh.

McIntosh, 1885, p. 225, pl. xxxv, figs. 10–12; pl. xviA, figs. 17–18.
Ehlers, 1897, p. 65, pl. iv, figs. 81–93.
Monro, 1930, p. 103.

Occurrence. St. MS 68 (1 juv.); WS 25 (numerous); WS 27 (3); WS 83 (1).

Specific characters. Up to about 40 mm. in length for 70 chaetigers. The tentacles are shorter than the head and the two pairs of eyes are widely separated. The jaws are brown and have five large teeth. The paragnaths are arranged as follows: (I) none or one; (II) a small triangular group; (III) a small, irregular, horizontal group; (IV) a triangular group; (V) none; (VI) one or two on each side; (VII) and (VIII) a single row of rather large paragnaths.

In the anterior region the feet have three stout triangular dorsal languets, the middle languet smaller than the others, and a dorsal cirrus slightly longer than the uppermost languet; in the ventral ramus the chaetal lobe has two dissimilar lips and there is a ventral languet about as long as the chaetal lobe. There is a tapering ventral cirrus shorter than the ventral languet. In the hinder region the intermediate dorsal languet disappears and the languets become narrower and more pointed. There is no increase of size in the dorsal languet. The ventral cirrus is very short.

The dorsal bristles consist of homogomph spinigers: the upper ventral bristles are homogomph spinigers and heterogomph falcigers; the lower ventral bristles are also homogomph spinigers and heterogomph falcigers. There are no heterogomph spinigers.

Genus **Platynereis**, Kinberg

Horny paragnaths arranged in pectinate rows of minute denticles. Groups I, II and V usually absent.

Platynereis magalhaensis, Kinberg (Fig. 24).

Fauvel, 1916, p. 434, pl. viii, figs. 21, 22, with synonymy.
Monro, 1930, p. 106, fig. 37.

Occurrence. St. 53 (2 juv.); WS 762 (numerous); WS 852 (6).

Specific characters. Up to about 80 mm. in length for 90 chaetigers. Just in front of the buccal segment in the median dorsal line there is a small nuchal cushion and on either side of this a small crescentic ridge behind the eyes (Fig. 24). The paragnaths are small: (I) none; (II) none; (III) a small transverse distichous group; (IV) several rows of pectinae; (V) none; (VI) one or two concentric arcs on each side; (VII) and (VIII) several small groups composed of one or two rows of small paragnaths.

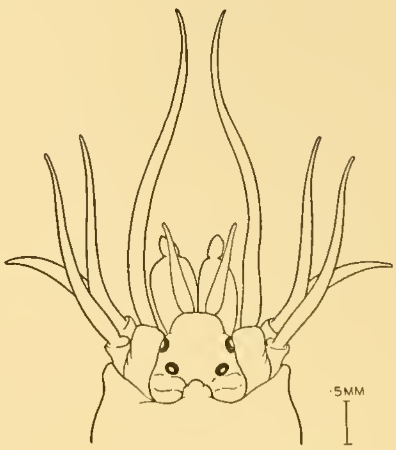

Fig. 24. *Platynereis magalhaensis.* Head from above.

The dorsal ramus of the anterior feet has a pair of triangular, subequal languets and a small conical chaetal lobe. There is a pair of dark glands in the dorsal languet, which is shorter than the dorsal cirrus. In the ventral ramus there is a blunt chaetal lobe and a ventral languet a little longer than the lobe. There is a small ventral cirrus. In the hinder region the pedal languets are narrower and more elongate. The dorsal bristles are homogomph spinigers: the upper ventral bristles are homogomph spinigers and heterogomph falcigers; the lower ventral bristles are heterogomph spinigers and heterogomph falcigers. In young specimens in the hinder region the dorsal ramus carries one or two special homogomph falcigers with curved tips attached to the blade.

Remarks. I have already (1930, p. 106) discussed the relations of this species and I have nothing to add.

Genus Leptonereis, Kinberg

No paragnaths on the proboscis. Jaws are present and sometimes a number of soft papillae.

Leptonereis loxechini (Kinberg).

Nereis loxechini, Ehlers, 1908, p. 73, pl. vii, figs. 8–12; and 1913, p. 497.
Leptonereis loxechini, Monro, 1930, p. 107, fig. 38.

Occurrence. St. 123 (3); 170 (2); 175 (2); WS 225 (1); WS 228 (8); WS 231 (1); WS 246 (20); WS 248 (8); WS 249 (1); WS 773 (1); WS 781 (1); WS 803 (1); WS 824 (28); WS 825 (numerous); WS 840 (numerous); WS 851 (1); WS 871 (10); WS 877 (2).

Specific characters. Size up to about 175 mm. by 8 mm. including the feet. In spirit the body is without colour-markings. There are no paragnaths. The first two feet are uniramous. In the anterior region the notopod has two large languets, the lower rather shorter than the upper, and between them a third much smaller languet. The dorsal cirrus extends well beyond the end of the upper dorsal languet. The neuropodial lobe has two unequal lips, the anterior rounded and the posterior longer and conical. The ventral languet is broader and blunter than those of the notopod. The ventral cirrus reaches to the end of the ventral languet. The posterior feet differ from the anterior only in the more slender and pointed character of the languets.

The dorsal bristle-bundle contains homogomph spinigers; the upper ventral bundle homogomph spinigers and heterogomph falcigers; the lower ventral bundle heterogomph spinigers and heterogomph falcigers.

REMARKS. Below the 100-m. line this is by far the most abundant Nereid in the Falkland Island area.

Family NEPHTHYDIDAE

Genus Nephthys, Cuvier

Body elongate, more or less quadrangular in section. Prostomium polygonal and flattened. Four small tentacles. Proboscis with rows of soft papillae and a crown of terminal double papillae. A pair of jaws within the pharynx. Feet biramous provided with membranous, leaf-like lobes and simple bristles. There is a coiled, sickle-shaped branchia between the two rami.

1.	With "lyre" bristles	*N. dibranchis*
	Without "lyre" bristles	2
2.	With posterior ventral lamella laciniated	*N. serratifolia*
	With posterior ventral lamella smooth...	3
3.	With 22 rows of papillae on the proboscis	*N. squamosa*
	With 14 rows of papillae on the proboscis	*N. macrura*

Nephthys dibranchis, Grube.

Monro, 1933, p. 56, text-fig. 24, with synonymy.

OCCURRENCE. St. 939, New Zealand (1).

SPECIFIC CHARACTERS. A slender, elongate species. There are usually 22 terminal, labial papillae and 22 rows of papillae. The dorsal ramus of the foot has a short, bluntly pointed, anterior lamella, a longer and also pointed chaetal lobe, and a rounded posterior lamella set very high and rather above the foot. In the ventral ramus the anterior lamella has a short pointed upper lobe lying just below the so-called ventral branchia and an inferior lobe that is scarcely indicated. Below, and extending beyond the upper lobe of the anterior ventral lamella, there is a prominent chaetal lobe, and behind this is the posterior ventral lamella, which is rounded and occupies the whole of the back of the ventral ramus. Lyre bristles are present.

Nephthys serratifolia, Ehlers.

Ehlers, 1897, p. 24, pl. i, fig. 13.
Monro, 1930, p. 114, fig. 41 *a*, *b*.

OCCURRENCE. St. WS 219 (2); WS 220 (1); WS 228 (2); WS 772 (3).

SPECIFIC CHARACTERS. Size up to about 60 mm. by 4 mm. for 100 chaetigers. The proboscis in all my specimens was withdrawn. Ehlers gives 20 terminal papillae and 15 rows with six or seven papillae in a row, the foremost being long and conical. In the feet there are a rounded upper posterior dorsal lamella, a slender lanceolate lower posterior dorsal lamella, a cirriform process at the base of the gill, a slender anterior

digitiform process, a laciniated posterior ventral lamella with the edge cut into about five processes and a small pointed anterior ventral lamella. There is also a scale-like process behind the ventral cirrus.

Nephthys macrura, Schmarda.

Fauvel, 1916, p. 436, pl. viii, figs. 1–3, with synonymy.
Monro, 1930, p. 111.

OCCURRENCE. St. 123 (4); 144 (4); 164 (6 juv.); 190 (1); 366 (12); 368 (1); 456 (10); 458 (numerous); 474 (3); 599 (1); WS 212 (5); WS 228 (1); WS 236 (1); WS 244 (1); WS 772 (1); WS 773 (5); WS 774 (1); WS 783 (2).

SPECIFIC CHARACTERS. Up to about 200 mm. in length. There are two groups of minute eye-spots at the base of the prostomium. The proboscis has 22 terminal papillae and 14 rows of papillae, each of which forks at the base into two or more divergent rows of minute papillae. The feet are very variable. There is always a rounded upper dorsal lamella, a lower dorsal lamella gathered to a point at its apex, and a lanceolate ventral lamella. There are no "lyre" bristles.

St. 458 yielded a superb specimen measuring 230 mm. in length from the tip of its extruded proboscis by 15 mm. in breadth without the feet, and with a thickness of 11 mm. The body-colour is a fine iridescent purple.

Nephthys squamosa, Ehlers?

Ehlers, 1887, p. 128, pl. xxxvii, figs. 7–10.

OCCURRENCE. St. WS 808 (12).

SPECIFIC CHARACTERS. About a dozen specimens, mostly small fragments. Among them are two or three fully grown examples, the largest of which measures 180 mm. by 7 mm. without the feet. None has the proboscis everted, and by dissection I can only discover that there are about 20 rows of papillae on the proboscis. Ehlers gives 22 rows of papillae and a single, large anterior papilla both dorsally and ventrally. The feet seem to correspond to Ehlers' account. There are in the dorsal ramus a rounded, scale-like, upper posterior lamella, a long, pointed, lanceolate, lower posterior lamella, and a small leaf-like branchial cirrus; the ventral ramus has a small tongue-shaped process lying above the bristles and a long, leaf-shaped, pointed, ventral posterior lamella.

REMARKS. This species is known from the tropical belt on both sides of the Atlantic, but I am somewhat sceptical of its occurrence as far south as the present locality. Unfortunately, I have no material other than two small anterior fragments from Gorgona Island in the Pacific, which I myself rather doubtfully assigned to *squamosa*, with which to compare the present specimens. Their feet agree well enough with Ehlers' account, but I have not been able to discover the exact arrangement of the papillae on the proboscis. Their precise attribution must for the present remain doubtful.

Family GLYCERIDAE

1. Body not divided into regions. Four jaws and no small paragnaths ... ... *Glycera*
   Body divided into two distinct regions. Two large jaws and numerous small paragnaths... 2
2. Notopodial bristles capillary. Chevrons usually present on the proboscis ... ... *Goniada*
   Notopodial bristles acicular and plumed. No chevrons on the proboscis ... ... *Glycinde*

Genus **Glycera**, Savigny

Body rounded and tapered at both ends. The segments are bi- or triannulate. Head sharply conical, ringed, ending in four small tentacles. Proboscis clavate with four hooked jaw-plates. Feet biramous with minute dorsal cirri. The pedal lobes have two anterior and one or two posterior lips. There is a large ventral cirrus. Branchiae may be present or absent; they may be simple or branched, retractile or not retractile. Dorsal chaetae simple capillaries, ventral chaetae compound spinigers.

Glycera capitata, Oersted.

Fauvel, 1923, p. 385, fig. 151 *a–e*.
Monro, 1930, p. 115.

Occurrence. St. 123 (1); 144 (3); 175 (1); WS 90 (1); WS 228 (3); WS 246 (1).

Specific characters. A slender species up to about 60 mm. in length. The body-segments are three ringed. Head with about eight rings. Papillae of proboscis of two kinds, the more numerous long and cylindrical, the rest short and ovoid. The feet are short with two anterior lips and a single posterior. The anterior lips are conical and the upper is a little shorter than the lower. The posterior lip is short, broad and rounded. The dorsal cirrus is a small globular process set very high up above the foot. The ventral cirrus is broad and conical. There are no branchiae.

Genus **Goniada**, Audouin and Milne-Edwards

Body divided into two regions, an anterior region with uniramous feet and a posterior with biramous feet. The proboscis is papillated; and there is a pair of large toothed jaw-plates and a circlet of small paragnaths. In addition on each side of the base of the proboscis there is a longitudinal row of V-shaped paragnaths (chevrons). These are sometimes absent in adult specimens. There are no branchiae. The dorsal bristles are capillary and the ventral compound.

Goniada eximia, Ehlers (Fig. 25 *a–j*).

Ehlers, 1901, p. 157, pl. xx, figs. 7–17.

Occurrence. Stanley Harbour, Falkland Islands between tide-marks (1).

Specific characters. The single specimen is a gigantic glycerid measuring 76 cm. by 1·3 cm. without the feet at the widest part for 258 chaetigers. Some of the hindmost segments are missing. The colour in spirit is yellowish green. The body is somewhat flattened dorso-ventrally and tapered at each end, the tapering in front being much more pronounced than that of the hinder region. The head is extremely small for the size of the animal, measuring only 4 mm. in length. It is rather blunt, composed of about eight rings and ends in the usual four small tentacles. I see no eyes. The proboscis is partly extruded and is densely covered with small papillae, not arranged in

definite areas. These papillae (Fig. 25 *a*) are of a curious shape, as shown in the figure. There are no chevrons. There are a pair of large jaws, each with five teeth, and a circle of about 22 small X-shaped paragnaths (Fig. 25 *b*). In addition to this circle of small paragnaths, there are a few additional even smaller paragnaths forming an irregular second row behind the main circlet. These additional paragnaths are of the same form as the rest but smaller.

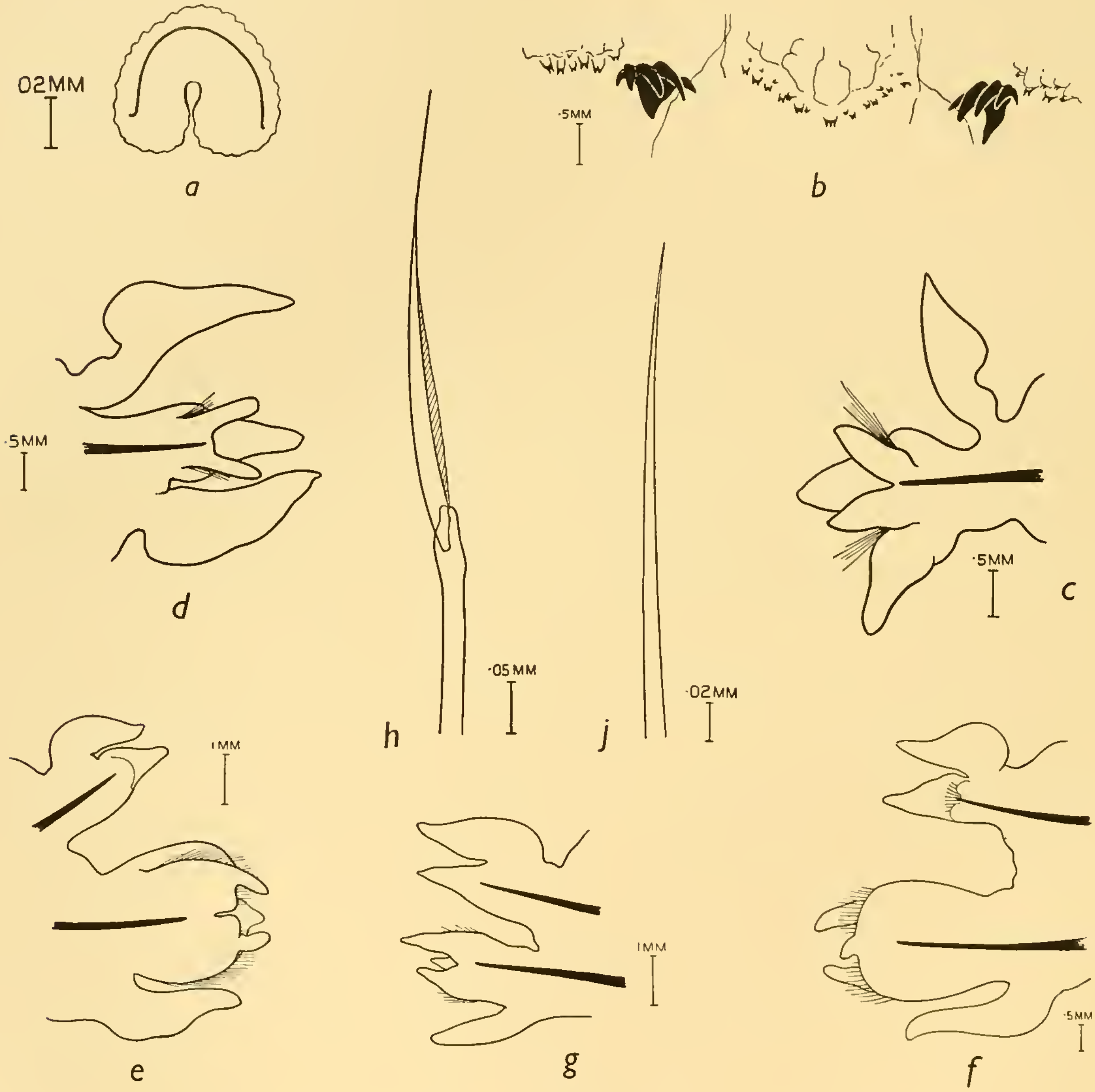

Fig. 25. *Goniada eximia.*

a. Papilla from proboscis.
b. Jaws.
c. Tenth foot.
d. Forty-fifth foot.
e. Foot from middle region seen from in front.
f. Foot from middle region seen from behind.
g. Foot from hinder region seen from in front.
h. Ventral bristle.
j. Dorsal bristle.

In the anterior region the feet are uniramous and the change over to the biramous condition takes place at the 59th chaetiger. In front the feet (Figs. 25 *c*, *d*) increase in size with the widening of the body from before backwards. They comprise a large, flattened somewhat curved dorsal cirrus with a distinct border on its upper surface, a pedal lobe with two digitiform lips in front and a single triangular lip behind, and a ventral cirrus rather like the dorsal except that it is inserted farther forward on the foot. In addition to an increase in size from before backwards in the anterior region there is a tendency for the two anterior lips of the chaetal lobe to fuse proximally. Behind the 59th chaetiger in the biramous region there is a broad, flattened, dorsal cirrus and a triangular dorsal ramus of about the same size: in the ventral ramus the two anterior lips are fused proximally, only their pointed ends remaining free, and the posterior lip is a broad flattened structure resembling a tennis-racquet in shape with a small triangular process at the apex: below the ventral ramus there is a broad, flattened ventral cirrus (Fig. 25 *e*, *f*).

There is very little change in the shape of the feet throughout the body behind the 59th chaetiger except in the hindmost region, where the body begins to narrow and the feet become smaller. Here the upper of the two anterior lips of the ventral ramus increases in size relatively to the lower (Fig. 25 *g*). Otherwise there is no change.

In regard to the bristles, those of the ventral ramus are long compound bristles with faintly denticulated end-pieces (Fig. 25 *h*). The dorsal ramus is supported by an aciculum and carries a bundle of *simple capillary bristles* (Fig. 25 *j*) almost entirely enclosed within the dorsal ramus. Only their ends are free of the chaeta-sac and they are almost wholly hidden by the triangular anterior lip of the dorsal lobe.

Remarks. This species is a *Goniada* in everything except the possession of chevrons on the proboscis, and according to Ehlers chevrons are present in young specimens, but disappear in the adult. It is distinguished from other species by its size and by the great length of the anterior uniramous region. It seems to be more closely related to *G. longicirrata*, Arwidsson, than to any other species, but is distinguished by differences in the dorsal bristles and by the structure of the jaws.

Genus **Glycinde**, Müller

Body divided into two regions, an anterior region with uniramous feet and a hinder region with biramous feet. The proboscis is long and clavate, and covered with papillae. There is a pair of large, toothed jaw-plates and a circlet of small paragnaths. There are no V-shaped chevrons on the proboscis. The dorsal bristles are acicular and plumed and the ventral bristles are compound spinigers. There are no branchiae.

Glycinde armata (Kinberg) (Fig. 26).

Arwidsson, 1898, p. 54, pl. iii, figs. 50–51.
Fauvel, 1916, p. 438.

Occurrence. St. WS 215 (2); WS 764 (1); WS 766 (2); WS 772 (1); WS 820 (1).

Specific characters. A slender species strongly tapered anteriorly. The largest specimen is incomplete and measures 24 mm. by 2 mm. for 98 chaetigers. Fauvel gives

a measurement of 45–50 mm. in length. In spirit about the first 30 chaetigers are colourless, and behind this the back develops a greenish colour which increases in intensity from before backwards. In some of the specimens the dorsal surface of the hindmost region is a greenish black interrupted by narrow light green intersegmental bands. The head has about nine rings and ends in four small tentacles. None of the specimens has the proboscis everted. I see between 15 and 20 X-shaped paragnaths and according to Arwidsson the paired jaw plates each have five teeth. I figure some papillae from the proboscis (Fig. 26).

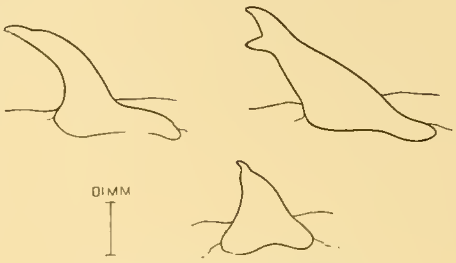

Fig. 26. *Glycinde armata*. Papillae from proboscis.

The change over from the uniramous to the biramous condition of the feet takes place between the 30th and 35th chaetigers.

In the uniramous region there is a large dorsal cirrus, a chaetal lobe with a pair of conical lips of which the hinder is longer than the anterior, and a ventral cirrus a little longer than the foot. In the biramous region there is a triangular dorsal cirrus, a small rounded dorsal lobe, a large ventral lobe with two digitiform anterior lips, and a single conical posterior lip and a triangular ventral cirrus.

The ventral bristles are all compound with lightly denticulated end-pieces; the dorsal bristles are stout acicular bristles surmounted by a kind of plume.

In regard to the eyes in this species, Arwidsson gives two pairs, but I can see only one pair in the present specimens.

Remarks. This species is akin to the northern *G. nordmanni*, but is easily distinguished by the division into two lobes of the anterior lip of the ventral ramus in the hinder region. This also distinguishes it from the Brazilian *G. multidens*, F. Müller.

In the original description of *G. pacifica*, mihi, from the Panama region I gave no account of the paragnaths. I have now re-examined the type and I find the usual pair of large jaws, each with five teeth, and 22 X-shaped micrognaths. The dorsal bristles are of the plumed acicular kind and show nothing distinctive. I suspect that further material will reveal that my species is a synonym of *G. multidens*.

Family SPHAERODORIDAE

Genus Ephesia, Rathke

Body elongate, subcylindrical. Prostomium with four papilliform antennae. The dorsal cirri consist of spherical capsules surmounted each by a small papilla. The buccal segment has dorsal cirri, but is achaetous. The feet are uniramous with either simple or compound bristles. A large ventral papilla takes the place of the ventral cirrus. The proboscis is cylindrical and unarmed. The pygidium has two spherical capsules. There is no striated gizzard.

Ephesia antarctica, McIntosh.

McIntosh, 1885, p. 361, pl. xlix, fig. 5; pl. xxiiA, figs. 22–23.
Ehlers, 1908, p. 107, pl. xliv, figs. 7–13.

Occurrence. St. WS 212 (1).

Specific characters. Up to about 50 mm. in length. The body is papillated. I can see only one pair of reniform eyes. Bristles compound with rather short pointed blades.

Remarks. Except that I can see only one pair of eyes I cannot separate this species from *E. peripatus* (Claparède). Unfortunately the only specimen of Claparède's species in the museum is of little use for purposes of comparison, but the descriptions of the northern species seem to be equally applicable to the southern.

Family EUNICIDAE

Subfamily *EUNICINAE*

Ovate frontal tentacles absent. From one to five occipital tentacles.

Genus Eunice, Cuvier

Body elongate. A pair of bulbous palps. Five tentacles with smooth tentaculophores. A pair of tentacular cirri on the second segment. First and second segments apodous. Dorsal cirri elongate, ventral cirri short or cushion-like. Branchiae simple or pectinate. Feet sesquiramous, with acicular chaetae, simple, compound, and comb-bristles. Upper jaw with a pair of mandibles, two or three toothed plates and an unpaired plate on the left side. Lower jaw of two pieces.

1.	Branchiae continued to the end of the body	*E. frauenfeldi*
	Branchiae confined to the anterior region	2
2.	Subacicular hooks bidentate	*E. pennata*
	Subacicular hooks tridentate	*E. australis*

Eunice frauenfeldi, Grube.

Ehlers, 1901, p. 127.
Augener, 1931, p. 286.
Eunice magellanica, McIntosh, 1885, p. 265, pl. xxxvii, figs. 12–15; pl. xixA, figs. 6–9.

Occurrence. St. WS 763 (3); WS 764 (1); WS 776 (numerous); WS 788 (1); WS 852 (3).

Specific characters. A full-grown example of this species measures about 300 mm. by 6 mm. at the widest part for about 200 chaetigers. The prostomium is bilobed and the tentacles are indistinctly annulated. The gills usually begin at the 6th chaetiger and are continued to within three or four segments from the end of the body. In the anterior third of the body the maximum number of filaments is usually eight or nine, but there may be as many as 14: in the middle region the number drops to four or five, and in the hinder region it increases again to seven or eight. In the latter region the filaments are set very close together and the gills often have a bushy appearance, as McIntosh indicates. The feet are supported by two large acicula which are black except towards

their tips which are pale yellow. The hooded bidentate subacicular bristle which begins about the 30th chaetiger is similarly coloured. From about the 7th to the 60th chaetigers the ventral cirri are transformed into large ovate glandular organs.

The dental formula is approximately: 6 – 6 : 10 + 5 – 12.

Eunice pennata (O. F. Müller).

Fauvel, 1923, p. 400, fig. 156 *h–o*.
Monro, 1930, p. 118, fig. 42 *a*, *b*.
Eunice antarctica, Baird, 1869, p. 348.
Eunice narconi, Baird, 1869, p. 350.

OCCURRENCE. St. 160 (1); 474 (1); WS 177 (1); WS 804 (1); WS 871 (8).

SPECIFIC CHARACTERS. Head very slightly indented in front. Tentacles irregularly annulated. Gills beginning on the third to fifth feet and confined for about the first 50 chaetigers. Maximum number of filaments about 15. The acicula are yellow and the hooded, bidentate, subacicular chaeta begins between the 30th and 35th chaetigers. The dental formula is 8 or 9 – 9 : 9 or 10 + 7 or 8 – 12.

Eunice australis, Quatrefages.

Fauvel, 1917, p. 228, fig. xxi *a–d*, with synonymy.

OCCURRENCE. St. 929, New Zealand (2); 935, New Zealand (5).

SPECIFIC CHARACTERS. Tentacles annulated. Gills beginning at the third to seventh feet and confined to the anterior third of the body. Subacicular bristles tridentate. Dental formula approximately 6 – 7 : 6 + 8 – 12.

Subfamily ONUPHIDINAE

A pair of ovate frontal tentacles. Five occipital tentacles all with ringed tentaculophores.

1. Gills with filaments arranged in a spiral ... ... *Diopatra*
   Gills simple or pectinate... 2
2. With no tentacular cirri ... ... *Hyalinoecia*
   Tentacular cirri present 3
3. First three feet greatly enlarged and carrying long bristles with hooked ends ... ... *Rhamphobrachium*
   First three feet only slightly enlarged and carrying small simple or pseudo-compound crochets ... ... *Onuphis*

Genus **Diopatra**, Audouin and Milne-Edwards

A pair of cushion-like palps. In addition to the paired frontal tentacles and the five occipital tentacles there is a pair of small tentacular cirri borne on the first (apodous) segment. The gills have the filaments arranged spirally around a main axis. Pseudo-compound bristles in the first few feet, followed by capillary, acicular and comb-bristles. Upper jaw with mandibles, three pairs of toothed plates and an unpaired plate.

Occipital tentacles short. Lower jaw plates heavy and large ... ... *D. punctifera*
Occipital tentacles long. Lower jaw-plates thin, delicate ... ... *D. neapolitana*

Diopatra punctifera, Ehlers.

Ehlers, 1908, p. 79, pl. x, figs. 1–11.
Monro, 1930, p. 124, fig. 44 *a*, *b*.

Occurrence. St. WS 4 (numerous).

Specific characters. These specimens are merely additional to those discussed by me under this heading in 1930. The occipital tentacles reach back to the 4th or 5th chaetiger. The gills begin at the 5th chaetiger, reach their maximum size at the 6th or 7th, maintain this maximum for about the following four or five chaetigers and then rapidly diminish in size. They disappear between the 40th and 50th chaetigers. The ventral cirrus ceases at the 5th or 6th chaetiger. The anterior pseudo-compound bristles are bidentate. The comb-chaetae are very delicate and have their sides curved inwards. There are between 15 and 20 short teeth. The subacicular bristles appear between the 10th and 15th chaetigers.

The dental formula is $7-8:7+6-9$. The heavy black lower jaw-plates are as figured by me (*loc. cit.* fig. 44 *b*).

Remarks. The question arises whether this species is identifiable with *D. neapolitana*, Delle Chiaje. I am inclined to keep it apart on the ground of the relative shortness of the tentacles, which in these numerous specimens at least appear to be consistently shorter than those in *neapolitana*, and on the ground of the heavy, black lower jaw-plates, which are very different from those of *neapolitana*. On the other hand, it should be added that they also differ from those originally described by Ehlers for *D. punctifera*.

Diopatra sp.

Occurrence. St. 149 (2).

Specific characters. Two young and rather ill-preserved specimens, the larger of which measures 20 mm. by 2 mm. for about 50 chaetigers. As far as can be seen from the rather poor material, they differ from the specimens of *punctifera* only in the following particulars. The occipital tentacles are relatively much longer and reach back to about the 10th chaetiger, the gills do not maintain their maximum size so far back on the body, diminishing more rapidly and ceasing about the 30th chaetiger, and the lower jaw-plates are slender and lightly chitinized. In fact I can find nothing to separate these specimens from *D. neapolitana*, but as I believe this to be the first record of a *Diopatra* from Antarctic waters and as the material is very scanty I am unwilling so far to extend the range of *neapolitana*.

Remarks. Fauvel (1933, p. 28) has contributed a valuable article on *Diopatra* in which he shows that the number of teeth on the comb-chaetae is of little, if any, value as a specific differential. We must, however, remain in the dark in regard to *Diopatra* until a revision has been made of the seven species described by Kinberg (1857, pp. 38–9). Of these, as far as my knowledge goes, the Australian *D. dentata* is the only one that has been redescribed with reference to the type (Augener, 1922, p. 37). I have recently (1933 and 1934) attributed specimens from the Panama Region and from China to *D. dentata*, basing my distinction from *neapolitana* on the fact that the branchiae

reach their maximum size by the second branchiferous segment, maintain this maximum for two or three segments only and then rapidly diminish in size, whereas in *neapolitana* the maximum gill development is often not attained for about the first 10 branchiferous segments (Fauvel in his *Faune de France* volume gives the 25th chaetiger) and is maintained farther back along the body. Also the comb-chaetae in these specimens had numerous very small teeth. The examination of several Mediterranean specimens of *Diopatra neapolitana* has, however, shaken my confidence in the value of this distinction based on the gills, and I remark that Fauvel states that in his Chinese specimens the gills reached their maximum development by the 8th chaetiger.

Moreover, even if *dentata*, as I understand it, be distinct from *neapolitana*, it is quite probable that *dentata* will prove to be identical with one or more of Kinberg's species, *D. leuckarti*, *viridis*, *amaena* and *brasiliensis* that have precedence by page.

Diopatra neapolitana, Delle Chiaje.

Fauvel, 1933, p. 28, figs. 3 *a–h*, 4 *a–l*.

Occurrence. St. 274. Off St Paul de Loanda, Angola (6).

Specific characters. These examples are supplementary to those from this station attributed by me (1930, p. 124) to *D. cuprea* (Bosc). The tentacles are very long, the occipitals reaching back to the 17th chaetiger. The gills begin at the 5th chaetiger, reach their maximum a few chaetigers farther back, and although they show a certain decrease in size after a few chaetigers, they remain sufficiently large to meet across the back up to about the 50th chaetiger. The comb-chaetae have about 20 teeth. The lower jaw-plates are rather delicate and lightly chitinized.

Remarks. The differences between this species and *D. punctifera* have already been discussed under the heading of that species. I can see nothing but the greater development of the gills to distinguish this specimen from the Antarctic examples from St. 149.

Genus **Rhamphobrachium**, Ehlers

Two cushion-like palps, two short frontal tentacles, and five occipital tentacles borne on ringed tentaculophores. A pair of tentacular cirri. Gills pectinate. Three anterior feet very large and pointing forwards. They carry very long bristles with hooked ends. Upper jaw with mandibles and toothed plates of which one is unpaired.

Rhamphobrachium ehlersi, Monro (Fig. 27 *a–c*).

Monro, 1930, p. 126, fig. 46 *a–i*.

Occurrence. St. 474 (1)

Specific characters. An anterior fragment measuring 27 mm. by 5 mm. across the body for 40 chaetigers. Anterior tentacles globular. Outer laterals spindle-shaped with massive tentaculophores. Inner laterals more slender reaching to the anterior border of the 2nd chaetiger. Median tentacle slightly shorter. Stout tentacular cirri inserted on anterior border of first segment. The first three pairs of feet are much enlarged and carried forward beneath the body. These have a stout dorsal cirrus, a conical ventral

cirrus, and at the apex of the foot three small, retractile, papilliform lobes. Behind the first three chaetigers the feet are of the normal onuphid form. The ventral cirrus is transformed into a pad by the 6th chaetiger, and the prolongation of the hinder lip of the chaeta-sac disappears by the 10th chaetiger. The gills begin at the 10th–11th chaetiger and at the 20th are bifilamentous. None of my material shows more than two filaments. The fully developed gill is two or three times as long as the dorsal cirrus.

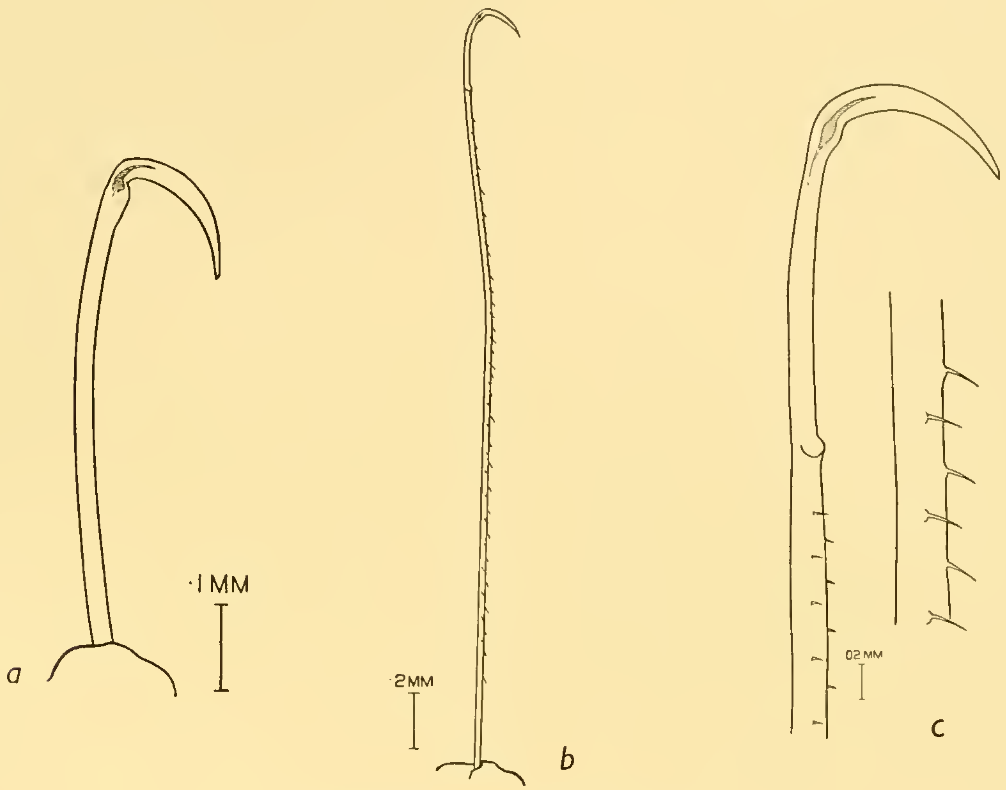

Fig. 27. *Rhamphobrachium ehlersi.*
a. Bristle from first foot. *b.* Bristle from third foot.
c. Bristle from third foot, highly magnified.

The bristles of the first three modified chaetigers are extremely long. Those of the first chaetiger are capillary with hooked tips, there being a suggestion of a false joint just below the hook (Fig. 27 *a*). Those of the 3rd chaetiger are of similar general structure, but the shaft carries two alternating rows of long spines which cease at a kind of notch which is situated a short distance below the hook (Fig. 27 *b*, *c*). The 4th and succeeding feet are supported by three long pointed yellow acicula. The 4th foot has dorsally capillary bristles and ventrally compound bristles with knife-like blades. At the 10th foot there are in addition several comb-chaetae. At about the 20th foot a pair of yellow hooded bidentate subacicular hooks appear and take the place of the compound bristles.

The dental formula is $7-9:9+6-6$.

Genus **Onuphis**, Audouin and Milne-Edwards

Two cushion-like palps, two short frontal tentacles, and five occipital tentacles borne on ringed tentaculophores. A pair of tentacular cirri is present. Gills simple or pectinate, sometimes absent. Pseudo-compound bristles in a few anterior feet, followed by capillary, acicular and comb-chaetae. Upper jaw with mandibles and toothed plates of which one is unpaired.

1.	Branchiae simple, cirriform	2
	Branchiae pectinate	3
2.	Branchiae beginning on 1st foot	*O. iridescens*
	Branchiae beginning about the 10th foot	*O. conchylega*
3.	Branchiae beginning about the 2nd foot	*O. aucklandensis*
	Branchiae beginning about the 6th foot	*O. dorsalis*

Onuphis conchylega, Sars.

Fauvel, 1923, p. 415, fig. 164 *a–m*.

Occurrence. St. 159 (1); WS 237 (2).

Specific characters. Branchiae simple, cirriform, beginning about the 10th foot. First two feet enlarged and directed forwards. They are provided with large simple hooks, and the 3rd foot has pseudo-compound unidentate or bidentate crochets. Comb-chaetae are present from the 2nd foot. Ventral cirrus absorbed at the 3rd foot. Cirriform postchaetal lip disappearing at about the 14th chaetiger.

Remarks. I have compared these examples with some specimens of this species from off the north of Scotland and they are undoubtedly conspecific. Augener (1931, pp. 295–8) has reviewed the types of the species of *Onuphis* described by Kinberg from the South Atlantic. *O. verngreni* is a *Rhamphobrachium*; the type of *O. setosa* has disappeared and that of *O. fragilis* is not well enough preserved to be determinable. Both *O. setosa* and *O. fragilis* are described as having "branchiae cirrosae" and I strongly suspect them both of being the same as *O. conchylega*, but under the circumstances Kinberg's names had better be dropped.

Onuphis iridescens (Johnson).

Northia iridescens, Johnson, 1901, p. 408, pl. viii, figs. 86–87; pl. ix, figs. 88–92.
Monro, 1930, p. 132.

Occurrence. St. WS 212 (5).

Specific characters. A slender, elongate, pearly white species. The single complete specimen measures 114 mm. by 2 mm. for 190 chaetigers. The tentacles are long and the inner pair of occipitals reaches back to the 8th or 9th chaetiger. The gills begin on the first foot and are continued to between the 20th and 40th chaetiger from the end of the body. They are single and cirriform throughout. The gills attain the same size as the dorsal cirrus at about the 5th foot and after that gradually increase in length relatively to the dorsal cirrus. The post-chaetal lip of the foot disappears at the 12th chaetiger and the ventral cirrus is absorbed at the 6th.

The pseudo-compound crochets of the first four chaetigers are tridentate. A pair of hooded bidentate subchaetal spines appear at about the 15th foot.

The dental formula is approximately $8-8:9+5-7$. The carriers taper down to fine points.

REMARKS. Without seeing Johnson's type I cannot be certain that these specimens belong to his species, but as far as his description goes I can find nothing to keep them apart.

Onuphis dorsalis (Ehlers).

Diopatra dorsalis, Ehlers, 1897, p. 71, pl. v, figs. 108–118.
Onuphis quadricuspis, Monro, 1930, p. 131, fig. 49 *a–c*.
Onuphis dorsalis, Augener, 1931, p. 294.

OCCURRENCE. St. WS 212 (2); WS 764 (2); WS 771 (3); WS 772 (12); WS 774 (5); WS 783 (2); WS 786 (4); WS 808 (7); WS 863 (1).

SPECIFIC CHARACTERS. Almost the only complete specimen measures 48 mm. by 2 mm. at the widest part for 110 chaetigers. The first five chaetigers are usually only slightly pigmented on the dorsum, the intensity of the pigment increasing from before backwards, but from about the 6th to the 25th chaetiger there are deep reddish brown transverse bands across the back. Behind this the pigment fades out rather rapidly. The first four or five chaetigers form a kind of neck, the segments being narrow and cylindrical and $1\frac{1}{2}$ times as long as a segment from the middle of the body. The ventral cirrus is converted into a pad by the 6th–7th chaetiger. The cirriform posterior lip of the chaeta-sac disappears about the 17th foot. The branchiae begin at the 6th chaetiger and about the last 45 chaetigers of the body are abranchiate. The number of filaments is variable. Usually there are only two filaments, the second filament appearing early in the branchiate region and disappearing at about the 40th chaetiger, but in a few specimens a third filament is developed at about the 30th chaetiger. And again in some of the smaller examples a second filament is not developed and the gills remain single throughout. The fully developed gill is longer than the dorsal cirrus.

The first five chaetigers have capillary bristles and pseudo-compound bristles; the arrangement of the latter is somewhat variable, but the most usual condition is for the first three chaetigers to carry perfectly smooth pseudo-compound bristles without teeth and apparently without hoods, as figured by me (*loc. cit.*, fig. 49 *b*). The 4th and 5th chaetigers carry in addition bidentate and tridentate pseudo-compound bristles. The comb-chaetae have about 12 rather long narrow teeth. At about the 15th chaetiger a pair of bidentate hooded subacicular hooks appear. The feet are supported by three rather slender yellow pointed acicula.

Ehlers figures the jaws. The dental formula is approximately $8-8:7+9-12$. M. V is represented by two small chitinous plates.

REMARKS. In 1930 I attributed several specimens of this species to *O. quadricuspis*, Sars, and I still think it very doubtful that *O. dorsalis* is more than a coloured form of Sars' species. Unfortunately the material of *O. quadricuspis* in the Museum collection

is very poor and of little use for purposes of comparison. The unidentate pseudo-compound bristles are puzzling because of the apparent absence of any hood. It may, of course, have been worn away.

Onuphis aucklandensis, Augener.

Augener, 1924, p. 418, fig. 11 *a–c*; and 1927, p. 172, fig. 7.
Fauvel, 1932, p. 146.

Occurrence. St. 938, New Zealand (1); 939, New Zealand (2).

Specific characters. I believe these to be young examples of Augener's species. None is complete. The largest measures 21 mm. by 2 mm. at the widest part for 86 chaetigers. In the anterior region the dorsum is banded with brown. The lateral occipital tentacles reach back to the 15th chaetiger (according to Fauvel to the 24th–27th). Apparently the normal condition is for the gills to begin on the 2nd chaetiger and to reach a maximum of about five filaments by the 7th chaetiger, but in two out of three of the present specimens the gills begin on the first chaetiger. The gills are bifid by the 4th–6th foot: in one specimen they are trifid at the 6th foot and in the other two trifid at about the 20th chaetiger. The maximum number of filaments is four, and this is reached by about the 25th chaetiger. The largest fragment still has bifid gills on the 86th chaetiger.

There are tridentate and bidentate pseudo-compound bristles in the first five chaetigers (Fauvel gives the first three). The ventral cirrus disappears at the 7th foot and the post-chaetal lip of the foot at about the 20th chaetiger. The bidentate hooks appear at the 15th chaetiger.

Remarks. Fauvel (1932, p. 146) records specimens of *O. eremita* with bifid gills behind the 10th–13th feet, and my specimens with the gill beginning on the 1st foot and branching on the 5th–6th are near to these, but on the whole they appear to be closer to Augener's species, especially as they are clearly the same as the specimen with the gill beginning on the 2nd foot.

Genus **Hyalinoecia**, Malmgren

Two cushion-like palps, two short frontal tentacles, and five occipital tentacles borne on ringed tentaculophores. The first achaetous segment is devoid of tentacular cirri. Pseudo-compound bristles are present in the first few chaetigers, followed by capillary, acicular and comb-chaetae. Upper jaw with mandibles and toothed plates of which one is unpaired.

Hyalinoecia tubicola (O. F. Müller).

Fauvel, 1923, p. 421, fig. 166 *i–q*.
Augener, 1924, p. 422.

Occurrence. St. 935, New Zealand (1); St. 936, New Zealand (6).

Specific characters. Gills simple cirriform, beginning at the 20th–25th chaetiger. First two chaetigers with simple bidentate hooded crochets (pseudo-compound in young specimens). Tube free, transparent, horny, not covered with sand-grains.

Subfamily *LUMBRINEREINAE*

No external tentacles (except in *Augeneria*), and no ventral cirri. Dorsal cirri rudimentary or absent.

1.	With nuchal tentacles	*Augeneria*
	Tentacles absent	2
2.	Gills present in anterior region	*Ninoë*
	No gills	3
3.	Crochets present in the feet	*Lumbrinereis*
	No crochets	*Drilonereis*

Genus Lumbrinereis, Blainville

Head conical or globular, devoid of all appendages. Dorsal cirri absent or rudimentary, ventral cirri and gills absent.

Bristles, winged capillaries and simple or compound hooks. Labrum composed of two pieces. Upper jaws with a pair of mandibles and three pairs of jaw-plates.

1.	Head more or less globular	*L. cingulata*
	Head conical	2
2.	No compound crochets...	*L. heteropoda*
	Compound crochets present	*L. magalhaensis*

Lumbrinereis magalhaensis, Kinberg.

Ehlers, 1897, p. 74.
Gravier, 1911, p. 78, pl. iii, figs. 35–36.
Lumbrinereis kerguelensis, Grube, McIntosh, 1885, p. 246, pl. xxxvi, figs. 16–17; pl. xvii A, fig. 18; pl. xviii A, figs. 2–4.

Occurrence. St. 27 (12 juv.); 30 (7); 144 (numerous juv.); 366 (2); 456 (2); 474 (1); WS 33 (4 juv.); WS 215 (1); WS 856 (1).

Specific characters. The largest specimen is incomplete and measures 127 mm. by 4 mm. for 130 chaetigers. The prostomium is pointed, conical. Ventrally the second buccal segment is involved with the mouth. The pedal lips are short and rounded and there is no increase in size of the hinder lip in the posterior region. In the front region the bristles consist of slender bordered capillaries and compound crochets. The latter have a wide independent flange below the pseudo-articulation. Farther back, usually between the 20th and 30th chaetigers, the compound crochets are replaced by simple crochets, and the bordered capillaries disappear. Their place of disappearance is variable, but in adult specimens it appears to be in the neighbourhood of the 70th chaetiger.

As regards the upper jaws, M. II have four teeth, M. III and M. IV are unidentate and there is often an accessory M. V.

Remarks. I have examined the original specimens of McIntosh's *kerguelensis*, Grube, and in my opinion they belong to this species. Benham remarks that the simple crochets of his specimens more closely resembled McIntosh's figure (pl. xviii A, fig. 1) of those of *L. japonica* than his figure (pl. xvii A, fig. 18) of the crochets of *L. kerguelensis*. I have examined the toothed heads of a series of simple crochets and I find them very variable in appearance, partly, I believe, as the result of wear. McIntosh's figure

showing a rather large main tooth is correct, but often the teeth are worn down or broken away, when the heads of the crochets are like those figured by McIntosh for *L. japonica*.

Lumbrinereis heteropoda, Marenzeller.

Crossland, 1924, p. 4, text-figs. 1–7, with synonymy.

OCCURRENCE. St. WS 4 (7).

SPECIFIC CHARACTERS. The head is conical. The feet increase in length from before backwards, and in the hinder region the posterior lip of the foot is produced into a long and often erect cirriform process. In the front region there are capillary bristles only, and farther back there are both capillary bristles and simple crochets. The latter first appear between the 10th and 40th feet. This is a large species measuring as much as 7 mm. in breadth.

Lumbrinereis cingulata, Ehlers.

Ehlers, 1897, p. 76, pl. v, figs. 119–124.

OCCURRENCE. St. WS 755 (2); WS 762 (2); WS 834 (2).

SPECIFIC CHARACTERS. I have with some hesitation attributed these specimens to Ehlers' species. One complete example measures 59 mm. by 2 mm. for 82 chaetigers and there are several much larger fragments measuring 3–4 mm. in breadth. Only the specimens from St. WS 762 show traces of the speckling regarded by Ehlers as characteristic of this species. Ehlers describes this species as speckled on both surfaces with small dark spots, except intersegmentally and except for a narrow dorsal transverse band in the middle of the segments. In several of these specimens, but not in all, a transverse ridge or thickening of the cuticle can be seen in the middle region of the body connecting the feet across the back, in exactly the position of the mid-segmental unpigmented band in the speckled specimens. Moreover, there is a marked tendency in the middle region for the front border of the segments dorsally to overlap and to be folded over the hinder border of the segment in front.

The head is bluntly ovate or more or less globular. The first buccal segment is apparently incomplete ventrally, where it is replaced by a prolongation of the second buccal segment.

The anterior lip of the foot is low and rounded and the posterior shows a short, blunt prolongation which has no relative increase in the hinder region. In the front region the bristles consist of winged capillaries and compound crochets with narrow flanges. Between the 10th and 20th chaetigers the compound crochets are replaced by simple crochets, and in the middle and hinder regions a different type of capillary bristle takes the place of the ordinary winged capillaries. In the middle and in the hinder region except for a few terminal segments there are one or two bristles about equal in length to the crochets and having very wide wings confined to a short area not far below the fine hair-like tip. These wings are curved backwards in a characteristic manner. The feet are supported by two brown acicula.

In regard to the jaws M. II have four to five teeth, M. III are bidentate, and not unidentate as Ehlers records: the second tooth is small and easy to overlook. M. IV are unidentate. The lower jaws are striated in front.

REMARKS. Apart from the speckling which cannot always be seen in preserved specimens, the outstanding features of this species are the more or less globular prostomium, the characteristic capillary bristles of the middle and hinder regions, and the presence of two teeth in M. III.

Lumbrinereis sp., near impatiens, Claparède.

OCCURRENCE. WS 756 (1).

SPECIFIC CHARACTERS. A large incomplete specimen measuring 110 mm. by 3 mm. The head is conical, and several grooves run up from the second buccal segment to the mouth. In the front region the feet are fairly well preserved and the hinder lip is conical and longer than the front lip. The acicula are yellow. In the front region the chaetae consist of winged bristles and simple crochets with long guards. In the middle and hinder regions the guard of the simple crochets is much shorter, and the capillary bristles disappear. In the present specimen they persist at any rate as far as about the 80th chaetiger. In the middle and hinder regions the feet are macerated and collapsed, and it is impossible to see whether there is an increase in size of the hinder lip of the foot in the posterior region. The jaws differ from those of a typical *impatiens*: M. II have five teeth; and M. III are unidentate, and not bidentate.

REMARKS. In the form of the head and of the bristles this specimen agrees with *impatiens*. It differs to some extent in the structure of the jaws, and unfortunately the shape of the hinder feet cannot be ascertained. It may represent a new species.

The Chilean *L. bifilaris*, Ehlers, has a similar arrangement of bristles, but the pedal lips in the hinder region become greatly elongated.

L. antarctica, mihi, is similarly devoid of compound crochets, but it has black acicula, capillary bristles only in the first 10 chaetigers, and jaws with three teeth in M. II.

Genus Augeneria, Monro

Head conical and with three small tentacles at its hinder edge partly hidden in a crescentic groove between the prostomium and buccal segment, as in *Aglaurides*. Dorsal and ventral cirri and gills absent. Bristles winged capillaries and simple and compound crochets. Jaws as in *Lumbrinereis* with a pair of mandibles and three pairs of plates.

Augeneria tentaculata, Monro.

Monro, 1930, p. 140, fig. 52 *a–k*.

OCCURRENCE. St. 599 (1); WS 212 (1); WS 236 (1); WS 773 (1).

SPECIFIC CHARACTERS. One specimen is complete and measures 170 mm. by 4 mm. at the widest part for 159 chaetigers. The head is of a rounded oval shape and there are no eyes. Of the three tentacles lying in the nuchal groove at the back of the head the median is a little larger and stouter than the rest. The second segment forms the lower border of the mouth.

The lobes of the feet are short, and in the anterior region the posterior lobe projects well beyond the anterior: it is more or less triangular in shape. In the hinder region the lobes are subequal, the posterior being more pointed than the anterior. In the front region the bristles consist of bordered capillaries and compound crochets. Farther back the compound crochets are replaced by simple crochets, and the dorsalmost bristle in each foot is a giant simple crochet. In the hinder region the capillary bristles lose their borders and disappear a short distance from the end of the body.

The lower jaw is short and rather stout. In the upper jaw M. I is a pair of pincers; M. II is a pair of heavy plates with three teeth; M. III has two teeth; M. IV is a pair of large plates without clearly defined teeth.

Genus Ninoë, Kinberg

Prostomium conical and devoid of appendages. In the front region the hinder lip of the foot breaks up into a number of cirriform branchial processes. Bristles winged capillaries and simple crochets. Upper jaws with a pair of mandibles and three pairs of plates.

Ninoë falklandica, n.sp. (Fig. 28 *a–l*).

Occurrence. St. WS 212 (1).

Specific characters. The single specimen measures 59 mm. by 2 mm. for 110 chaetigers. The body is scarcely at all tapered in front. The marked shortness and crowding of the segments in the anterior region observed by me (Monro, 1933, p. 89) in *Ninoë chilensis* is absent in this specimen, where the anterior segments are only three times as broad as long. The head is a pointed cone and lateral grooves are not evident. Ventrally the second apodous segment is continued forward in the median line to form the lower edge of the mouth (Fig. 28 *a*), exactly as described by Gravier (1911, p. 79) for *Lumbrinereis magalhaensis*. For about the first dozen chaetigers there is a gradual increase in size of the feet from before backwards. In the first two chaetigers (Fig. 28 *b*) the feet consist of a very short anterior lobe and a blunt triangular posterior lobe. By the 3rd chaetiger the posterior lobe is beginning to bud off a dorsal cirriform process (Fig. 28 *c*, *d*). By the 6th foot the posterior lobe has three slender branchial processes of which the uppermost is the largest. These branchial processes increase in number up to about the 15th chaetiger, where they show a maximum of six filaments (Fig. 28 *e*). The upper is always the largest and perhaps represents a dorsal cirrus. The branchiae disappear by the 32nd chaetiger.

In the postbranchial region the lips of the foot are short, rounded, subequal and the hinder lip is gathered at its apex to a small rounded process (Fig. 28 *f*). The feet are supported by short, dark brown acicula which vary in number according to the region of the body in which the feet are situated. Their maximum number of four or five is reached in the middle of the branchial region.

The first two or three feet have an upper bundle of bordered capillary bristles and a lower bundle of long, rather stout bristles with blunt heads and narrow borders which at first sight are not at all like a lumbrinereid crochet. In fact they are elongate

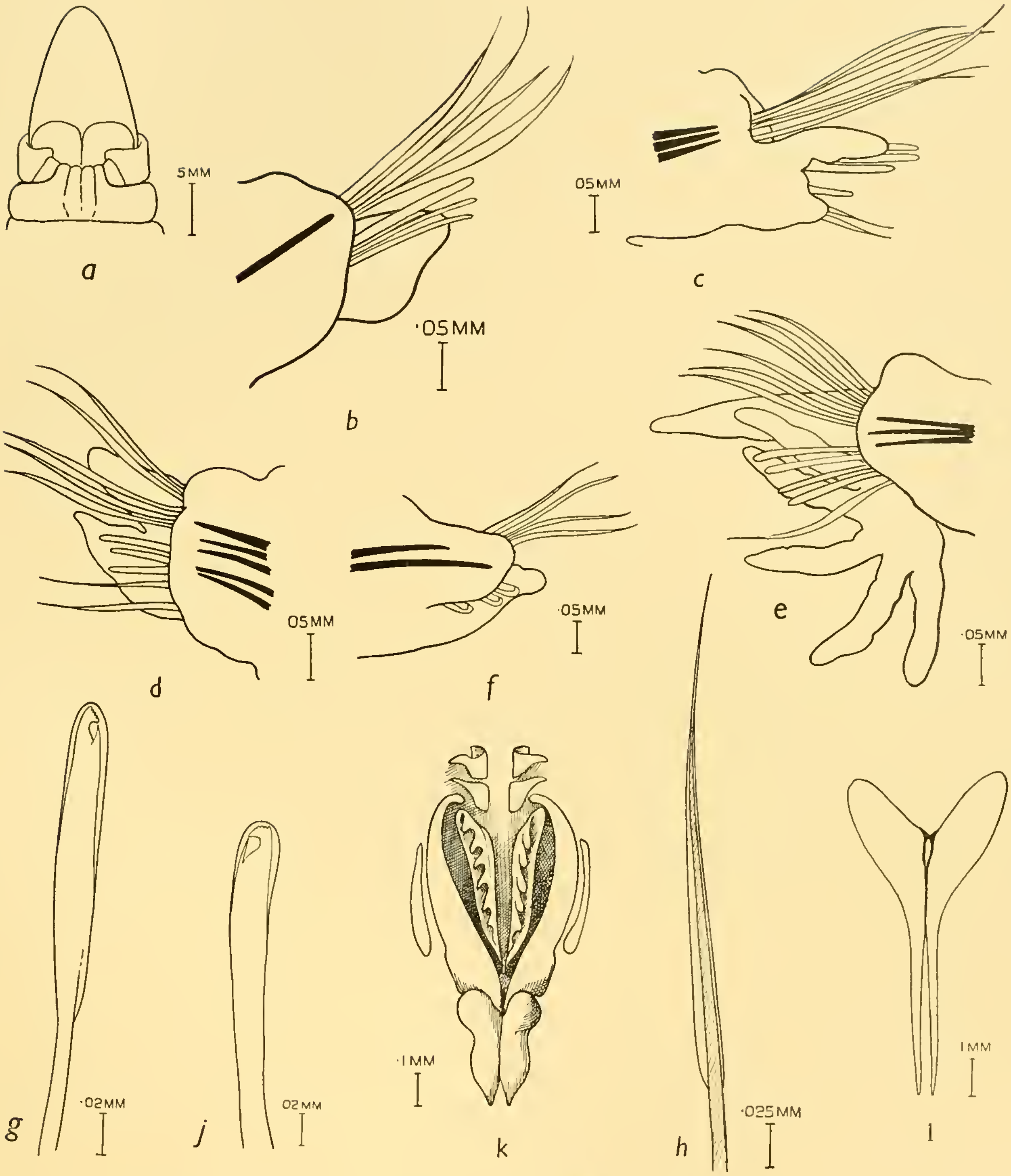

Fig. 28. *Ninoë falklandica.*

a. Ventral view of head.
b. First foot seen from in front.
c. Fourth foot seen from behind.
d. Fifth foot seen from in front.
e. Seventeenth foot seen from in front.
f. Foot from hinder region seen from in front.
g. Anterior crochet.
h. Bordered capillary bristle from seventeenth foot.
j. Posterior crochet.
k. Upper jaws.
l. Lower jaws.

lumbrinereid simple crochets with very long, narrow flanges and small denticulated heads (Fig. 28 *g*). Behind the first two or three feet and throughout the branchial region there are dorsally a number of bordered capillaries (Fig. 28 *h*), below this three or four elongate simple crochets and ventrally a second bundle of bordered capillaries. In the hinder region the ventral bundle of capillaries disappears and the bristles consist of bordered capillaries above and simple crochets below. These simple crochets are normal in form, being shorter and having wider flanges and heads with about seven well-developed teeth (Fig. 28 *i*). The specimen is incomplete behind and the bordered capillaries are continued to the last segment of the fragment.

I figure the jaws (Fig. 28 *k*, *l*). The carriers of the upper jaws are pointed. There is a pair of accessory plates lying outside the pincers: M. II have six teeth; M. III and M. IV appear each to be unidentate, and whereas the under side of M. III appears to be smooth, that of M. IV is finely denticulated.

Remarks. The Magellan *N. leptognatha*, Ehlers, seems to be quite distinct. In the first 35 chaetigers there are only capillary bristles and no crochets, and M. III and M. IV are strongly denticulated. I have compared the present specimen with those attributed by me (*loc. cit.*, 1933) to Kinberg's *N. chilensis*. The latter have a very different facies. Apart from the greater complexity of the gills in *chilensis*, to which not much importance may be attached, the second apodous, buccal segment is not involved with the mouth, and the manner of the breaking up of the posterior lip of the chaeta-sac into branchial filaments is different.

According to Kinberg's figure the second buccal segment of his *N. brasiliensis* is here also not involved with the mouth (Kinberg, 1857, pl. xviii, fig. 33 *c*).

Genus Drilonereis, Claparède

Head devoid of appendages. Gills and ventral cirri absent, dorsal cirri rudimentary. Bristles winged capillaries and at the base of the foot a large acicular spine. Labrum rudimentary or absent. Upper jaws show a pair of mandibles with very long, delicate supports, a pair of toothed plates and two to three pairs of hooks.

Drilonereis filum (Claparède).

Fauvel, 1923, p. 436, fig. 174 *a–h*.

Occurrence. St. WS 776 (1).

Specific characters. This is an anterior fragment measuring 51 mm. by 2 mm. for 65 chaetigers. A slender, elongate species. The prostomium is dorso-ventrally flattened, lanceolate in outline and often with a median groove. The first buccal segment is longitudinally grooved on the ventral side. The anterior lip of the foot is low, rounded and the hinder is produced into a blunt conical process. At the top of the foot is a bundle of small yellow acicula supporting a rudimentary dorsal cirrus. The acicula supporting the foot have slender protruding tips. The bristles consist of winged capillaries and at the base of the foot a large, light yellow acicular bristle. The jaws are variable. In the present specimen the pincers are very faintly denticulated at their base; M. II have

rather numerous—10 to 12—teeth; M. III have a large tooth, beneath which are one or two minute denticles; M. IV and M. V are unidentate. The labrum consists of a pair of more or less triangular plates.

REMARKS. This specimen shows certain differences from a typical *D. filum*. The capillary bristles are more elongate and narrowly bordered than is usual in this species. Only the anterior end of the animal is preserved, and I assume that the capillary bristles from the middle region would have shown the more typical rather wide wings. Moreover, although I cannot count the teeth of M. II exactly, they seem to be more numerous than in the European examples of this species. These differences do not in my opinion justify a separation. Ehlers has described a species from the Magellan region, *Aracoda tenuis*, which appears to be a *Drilonereis*. If Ehlers's figure of the upper jaws (Ehlers, 1901, pl. xix, fig. 9) is accurate, it would seem to be a distinct species, for it has four heavy teeth at the base of the pincers, M. II have about five large teeth and M. III have three large teeth instead of one main tooth and two or three minute denticles.

Family ARICIIDAE

With hooks in the thoracic region ... ... *Scoloplos*
No hooks in the thoracic region ... ... *Haploscoloplos*

Genus Scoloplos, Blainville

Prostomium conical. Buccal segment achaetous. A pair of erect strap-like branchiae on all but a few anterior segments. A somewhat flattened thoracic region passing gradually into a rounded abdominal region. Thoracic feet with an erect dorsal cirrus and a bundle of crenate capillary bristles; in the ventral ramus there are hooks and usually a number of capillary bristles. There may be one to three podial papillae or they may be absent. No subpodial papillae. In the abdominal region an erect dorsal cirrus, capillary bristles and sometimes forked bristles. A ciliated lateral organ takes the place of an intermediate cirrus. Ventral ramus bilobed with capillary bristles. Ventral cirrus often absent.

Scoloplos marginatus (Ehlers).

Aricia marginata, Ehlers, 1897, p. 95, pl. vi, figs. 150–156.
Benham, 1921, p. 77.
Monro, 1930, p. 144.
Nainereis marginata, Fauvel, 1916, p. 445, pl. viii, figs. 26–33.

OCCURRENCE. St. WS 25 (2).

SPECIFIC CHARACTERS. Prostomium bluntly conical. Between 11 and 14 thoracic chaetigers. The strap-like gills begin at the 6th chaetiger. Dorsal cirri lanceolate. Dorsal bristles delicately crenate and capillary. The ventral thoracic rami carry three rows of hooks and no capillary bristles. There are no podial papillae. In the abdominal region the dorsal bristles are long capillaries and forked bristles are sometimes present. The ventral ramus carries a large aciculum with a hooked tip and a few capillary bristles, the latter often disappearing towards the hinder end of the body.

Genus Haploscoloplos, Monro

As *Scoloplos*, except that there are no hooks in the thoracic region and an intermediate cirrus may be present in the abdominal region.

Haploscoloplos kerguelensis (McIntosh).

Scoloplos kerguelensis, McIntosh, 1885, p. 355, pl. xliii, figs. 6–8; pl. xxiiA, fig. 19.

Occurrence. St. 164 (numerous juv.); WS 742 (1).

Specific characters. The specimens from St. 164 are all young, measuring between 5 and 10 mm. in length by about 0·5 mm. in breadth. That from St. WS 742 is much larger, incomplete posteriorly and measures about 30 mm. by 2 mm. at the widest part. The prostomium is definitely pointed. The large specimen from St. WS 742 has 14 thoracic chaetigers and the gills begin at the 15th, and in the small specimens there are nine or ten thoracic chaetigers and the gills begin at about the 12th. There is no flattening of the dorsum in the thoracic region. The feet are provided with small, triangular, postchaetal languets and the bristles both dorsally and ventrally are crenate capillaries.

In the hinder region the gill is the usual flattened more or less leaf-shaped structure. The dorsal cirrus increases in size from before backwards and in the young specimens becomes filiform; in the larger specimen, however, it remains narrowly lanceolate and foliaceous rather than filiform. Moreover, the ventral ligule in this specimen has a bifid tip, whereas in the younger specimens it remains single. The bristles are crenate capillaries, the ventral being more slender than the dorsal. In the young specimens the dorsal rami also carry a few forked bristles.

Remarks. I have examined McIntosh's types and the complete absence of thoracic hooks is irreconcilable with Eisig's view that McIntosh's species is synonymous with *armiger*. Fauvel (1916, p. 443) has given an account of some young specimens of *kerguelensis* from the Falkland Islands which agrees fairly well with the present young examples from the South Orkneys. The forked bristles in the dorsal rami of the hinder region which he records are present in my young specimens, but absent from the larger example. They are probably characteristic of a certain stage of growth. I have not seen any acicular bristles similar to those described by Fauvel for the ventral rami.

Benham holds that the worms referred by Gravier (1911, p. 108) to *kerguelensis* are distinct and conspecific with a number of specimens from off Adélie Land which he has named *S. mawsoni*. Benham's *mawsoni* has 11 anterior segments, no forked bristles or acicula and the gill beginning on the 12th chaetiger. I confess that I am not convinced that Benham's species is more than a stage in the growth of *kerguelensis*. The fact that some of the specimens were sexually mature does not necessarily mean that they were fully grown. My young specimens from the South Orkneys are very close to Benham's account of *mawsoni*, but they have forked bristles which Benham regards as a differential character.

I have described two species of *Haploscoloplos*, *panamensis* from the Panama region and *tortugaensis* from Dry Tortugas. *H. panamensis* differs from *kerguelensis* in having subpodial papillae in the hinder part of the thoracic region and in having bilobed ventral rami in the hinder region. *H. tortugaensis* has an intermediate cirrus in the hinder region.

Family CIRRATULIDAE

Genus **Cirratulus**, Lamarck

Body long and cylindrical. Head conical. First three segments achaetous. Gills beginning on the first few chaetigers and continued over most of the body. Slender tentacular filaments appearing on the same segment as the first pair of gills. Pedal lobes very little developed. Either capillary bristles only in both rami or both capillary bristles and hooks in a certain number of feet.

1. Both capillary chaetae and hooks present ... ... *C. cirratus*
   With capillary bristles only 2
2. Tentacular filaments on first chaetiger... ... ... *C. filiformis*
   Tentacular filaments on 3rd–5th chaetigers ... ... *C. antarcticus*

Cirratulus cirratus (O. F. Müller).

Fauvel, 1927, p. 94, fig. 33 *a–g*.

Occurrence. St. WS 25 (2); WS 33 (2); WS 772 (2).

Specific characters. Head bluntly conical. A row of four to eight eyes on each side. Gills from the 1st chaetiger almost to the end of the body. Two groups of slender tentacular cirri, one on each side of the dorsal surface of the 1st chaetiger. Capillary bristles in both rami of the feet, and in addition hooks in the notopodia from about the 20th chaetiger and in the neuropodia from about the 10th.

Cirratulus antarcticus, Monro.

Monro, 1930, p. 155, fig. 59.

Occurrence. St. 144 (4); WS 766 (1).

Specific characters. Head bluntly conical. No eyes. The two postbuccal achaetous segments not clearly distinguished. Gills begin on 3rd chaetiger. About eight pairs of tentacular filaments on the 3rd–5th chaetigers. Capillary bristles only. Hooks absent.

Cirratulus filiformis, Keferstein.

Fauvel, 1927, p. 94, fig. 33 *h*.

Occurrence. St. 28 (numerous).

Specific characters. A large number of small thread-like, broken cirratulids, which appear to belong to this species. Branchiae are present from the 1st chaetiger throughout most of the body. There is a single pair of relatively stout tentacular filaments on the 1st chaetiger. There are capillary bristles only and no hooks.

Remarks. I believe this to be the first record of this species from Antarctic waters.

Family SPIONIDAE

Genus **Polydora**, Bosc

Prostomium notched or rounded in front, prolonged behind into a blunt crest. Two long ciliated palps. Branchiae begin on the 6th–9th chaetiger, rarely on the 2nd. Fifth chaetiger much modified with special, giant, dorsal bristles. Dorsal and ventral bristles capillary. Hooded bidentate crochets from the 7th–8th foot. An anal sucker.

Polydora natrix, Söderström.

Söderström, 1920, p. 254, figs. 165 and 166, with synonymy.
Polydora polybranchia, Fauvel, *nec* Haswell, 1916, p. 441, pl. viii, figs. 13–20.

OCCURRENCE. St. WS 27 (1).

SPECIFIC CHARACTERS. The single specimen measures about 10 mm. for 55 chaetigers. The prostomium is divided in front into two lobes by a median groove and is continued backwards as a narrow, laterally compressed crest as far as the 2nd chaetiger.

The 1st chaetiger carries dorsal as well as ventral bristles. The first branchia appears on the 2nd chaetiger and branchiae are continued to within about a dozen segments from the end of the body. The hooks begin on the 7th chaetiger. The modified 5th chaetiger carries two rows of large characteristic bristles. The anterior row consists of giant bristles with cup-shaped tips. These cups have a rugose surface and at one place the rim is raised to a low point. The posterior row consists of acicular bristles with hooked tips.

REMARKS. There are several records of this species from South America and the Falkland Islands under the name of *Polydora polybranchia*, Haswell. Fauvel in 1916 pointed out that this form differed from *polybranchia* in the possession of dorsal bristles in the 1st foot, a difference which led Söderström to establish it under a separate specific name.

Family CHAETOPTERIDAE

Genus **Chaetopterus**, Cuvier

Body large and stout, divided into three distinct regions. An anterior region with uniramous feet, paddle-shaped bristles and special modified bristles in the 4th foot. Middle region of five biramous segments, the first carrying a pair of wing-like appendages, the second with the dorsal ramus modified into a rounded sucker-like organ, the remaining dorsal rami fan-shaped. The ventral rami are lamellar, coalescent and carry rows of uncini. The hinder region has biramous feet, the dorsal rami being cylindrical and the ventral bilobed and uncinigerous. Tube horny or parchment-like.

Chaetopterus variopedatus (Renier).

Fauvel, 1927, p. 77, fig. 26 *a–n*.

OCCURRENCE. St. WS 583 (6); WS 837 (1).

SPECIFIC CHARACTERS. As there appears to be only one species, the specific characters are those of the genus.

Family CHLORHAEMIDAE

Body enveloped in a sheath of mucus ... ... *Flabelligera*
No mucous sheath ... ... *Stylarioides*

Genus **Stylarioides**, Delle Chiaje

Body elongated, cylindrical, sometimes tapering posteriorly into a kind of tail. The surface is papillated. Two large palps; gills filiform, borne on a retractile stalk. Bristles of the first few chaetigers directed forwards to form the cephalic cage. Dorsal bristles

capillary, annulated. Ventral bristles behind the first few chaetigers simple, rarely pseudo-compound, hook-like. Blood green.

Skin densely papillated, ventral hooks stout, unstriated ... ... *S. swakopianus*
Skin sparsely papillated, ventral hooks slender, narrowly striated ... ... *S. kerguelarum*

Stylarioides kerguelarum (Grube).

Trophonia kerguelarum, Grube, 1877, p. 539.
McIntosh, 1885, p. 364, pl. xliv, figs. 9–10; pl. xxiii A, figs. 4–6.
Stylarioides kerguelarum, Monro, 1930, p. 159.
Augener, 1932 *b*, p. 113.

OCCURRENCE. St. WS 33 (1).

SPECIFIC CHARACTERS. Sparsely papillated on the dorsal and ventral surfaces, more thickly between the feet where the papillae are long and finger-shaped. The bristles of the first two feet go to form the cage. The dorsal bristles of the normal feet are long and iridescent and spread fan-wise upwards and backwards. They are strongly segmented, and as McIntosh observes and figures the upper part of each segment is dilated distally. The hooks are figured by McIntosh; they are much longer and more slender than in *S. plumosus*, and lightly and narrowly striated except towards the tip which is not strongly hooked. There are about half a dozen of these hooks in each neuropod. They begin at the 3rd chaetiger.

The present specimen is small measuring only 10 mm. by 2 mm. at the widest part for about 25 chaetigers.

This species is distinct from *S. plumosus*. The papillation dorsally and ventrally is sparser, the hooks begin at the 3rd and not the 4th chaetiger and are much longer and more delicate; and the dorsal bristles are much more markedly segmented.

I have not seen Grube's type, but this specimen and those from South Georgia recorded in my 1930 report are conspecific with McIntosh's Challenger specimens which were collected at Kerguelen as was Grube's type. Augener (*loc. cit.*, 1932 *b*) has recorded *S. plumosus* from South Georgia. He claims that the *Trophonia kerguelarum* of Ehlers (1897, p. 107 and 1901, p. 180) belong in fact to *S. plumosus*, but that the *Trophonia kerguelarum* of Ehlers (1908, p. 180) from Kerguelen is a different species with more slender ventral hooks. The latter is presumably the true *kerguelarum* of Grube. He also suggests that the specimens from South Georgia attributed by me (*loc. cit.*, 1930) to *S. kerguelarum* belong to *S. plumosus*. In this he is mistaken.

Stylarioides swakopianus, Augener.

Augener, 1918, p. 433, pl. vii, fig. 234, text-figs. 61 and 62.
Monro, 1930, p. 159.
Stylarioides xanthotricha, Ehlers, *partim*, 1908, p. 119, pl. xvi, fig. 2.

OCCURRENCE. St. WS 4 (3).

SPECIFIC CHARACTERS. I have some hesitation in attributing these specimens to Augener's species because both they and the specimens from Tristan da Cunha attributed by me (*loc. cit.*, 1930) in a previous report to Augener's species differ from

Augener's account in one particular. The hooks begin at the 3rd chaetiger and not at the 4th as Augener states. In other respects they agree closely with Augener's description. Of the three specimens the tail in two is about one-fourth of the length of the rest of the body, and in the third and larger specimen it is about one-half. The latter measurement I believe to be misleading, as the body is much contracted and the tail well expanded. The animals have a shaggy appearance owing to the thick coating of papillae, which are rather longer in front than over the rest of the body. The bristles of the first two feet are directed forward and form a strong cephalic cage. In the normal feet the dorsal bristles are delicate striated capillaries. The hooks of which there are one to three in each neuropod begin at the 3rd chaetiger or first foot behind the cephalic cage. The hooks correspond closely to Augener's figure. There are no transverse striae.

Genus **Flabelligera**, Sars

Body fusiform, soft, enveloped in a thick mucous sheath, in which are embedded two kinds of stalked papillae. Two large palps. Branchiae numerous, retractile, attached to the head. Bristles of the first chaetiger, long, numerous and directed forward: they form the cephalic cage. Dorsal bristles capillary, annulated. From the 2nd chaetiger the neuropods carry one or two large compound or pseudo-compound hooks and a few long, capillary bristles. Blood green.

Flabelligera affinis, M. Sars.

Fauvel, 1927, p. 113, fig. 40 *a–f*; 1916, p. 450, with synonymies.

Occurrence. St. WS 221 (1); WS 762 (1).

Specific characters. Mucous sheath thick. Papillae with long stalks and with either fusiform and elongated or short and clavate ends. The bristles of the first foot form the cephalic cage.

The normal dorsal bristles are striated capillaries and from the 2nd chaetiger the neuropod carries one or two compound or pseudo-compound hooks.

Family OPHELIIDAE

1.	No ventral groove	*Travisia*
	A ventral groove present...	2
2.	Ventral groove extends over whole length of body	*Ammotrypane*
	Ventral groove absent from anterior region	*Ophelia*

Genus **Travisia**, Johnston

Body composed of two regions, an anterior cylindrical region and a narrower posterior region rectangular in section. There is a short conical prostomium and a pair of evaginable nuchal organs. The segments are divided by superficial rings. Cirriform branchiae on all chaetigers except the first and a few terminal segments. The posterior region is distinguished by lateral lobes or eminences. Notopods and neuropods reduced to bundles of simple capillary bristles. A lateral organ is present between the two rami. Pygidium in the form of an anal cylinder.

Travisia kerguelensis, McIntosh.

McIntosh, 1885, p. 357, pl. xliii, fig. 10; pl. xxviA, figs. 1–2.
Ehlers, 1897, p. 97, pl. vi, figs. 159–161.
Benham, 1927, p. 123.
Monro, 1930, p. 165, fig. 67 *a–c*.

Occurrence. WS 766 (1); WS 782 (1).

Specific characters. Between 23 and 27 segments, of which 10–11 are involved in the hinder region. The terminal segments are more or less laciniated or papillated. The anal cylinder comes off rather abruptly from the body.

Genus **Ammotrypane**, Rathke

Body not divided into distinct regions. A deep ventral and two lateral grooves throughout the entire length. There are a small conical prostomium, eyes beneath the skin, and paired evaginable nuchal organs. Segments superficially annulated. Cirriform branchiae present on all chaetigers except the 1st, and a few terminal segments. The feet have small parapodial lobes and two bundles of simple, capillary bristles. There is an anal cylinder which usually carries papillae.

Thirty-nine chaetigers and a pair of anal appendages ... ... *A. scaphigera*
Twenty-eight chaetigers and no anal appendage ... ... *A. breviata*

Ammotrypane scaphigera, Ehlers.

Ehlers, 1901, p. 172, pl. xxii, figs. 1–4.

Occurrence. St. WS 213 (1).

Specific characters. There are 39 chaetigers and all are branchiate except the first one and the last six. The body ends in a scoop-shaped anal segment with the concavity ventral, at the base of which is a pair of cirriform processes. Ehlers characterizes them as anal branchiae.

The present specimen measures 20 mm. by 1 mm. and is in rather poor condition. It agrees with Ehlers's description in the number of chaetigers and the possession of a pair of anal appendages, but the anal segment is too much damaged for comparison.

Ammotrypane breviata, Ehlers.

Ehlers, 1913, p. 523, pl. xxxix, figs. 1–7.

Occurrence. St. 167 (numerous); WS 215 (3); WS 782 (5).

Specific characters. The larger specimens from St. 167 measure about 34 mm. by 2 mm. for 28 chaetigers and have gills on every segment except the first one and the last four modified chaetigers. The anal cylinder is very faintly and irregularly ringed and its dorsal peak is more prominent than the ventral.

The specimens from St. WS 215 and St. WS 782 are about half the size of the others and all are in poor condition. They have 26 chaetigers instead of 28 and gills on all except the 1st and the last three modified chaetigers. Otherwise they are not separable from the larger forms. Better material might, however, reveal differences.

Genus Ophelia, Savigny

Body divided into two distinct regions, an anterior cylindrical region and a posterior region with a deep ventral and two lateral grooves. The head is a small pointed cone with two or three eyes beneath the skin. The segments are divided by superficial rings. Cirriform branchiae are present on all segments except about the first 10 and a few terminal segments. Notopods and neuropods are represented by small bundles of capillary bristles and sometimes by a pair of low rounded lobes. A lateral organ is present between the two rami, and the anal segment carries papillae.

Ophelia bipartita, n.sp. (Fig. 29 *a*, *b*).

Occurrence. St. WS 742 (4).

Description. A rather massive species. The number of chaetigers is 31, and the largest specimen measures 63 mm. by 7 mm. at the widest part. The colour in spirit is grey. The body is very sharply divided at the 8th chaetiger into two distinct regions (Fig. 29 *a*), as in the *Thoracophelia* of Ehlers, an anterior region of eight chaetigers without a ventral groove and a posterior region of 23 chaetigers with a profound ventral sulcus. The prostomium is a small, pointed cone. The branchiae begin at the 10th chaetiger and there are 17 pairs. Those in the middle of the body are long enough to meet across the back and all are crenate. The last five chaetigers are abranchiate and the last four have specially long bristles and are involved in the anal region.

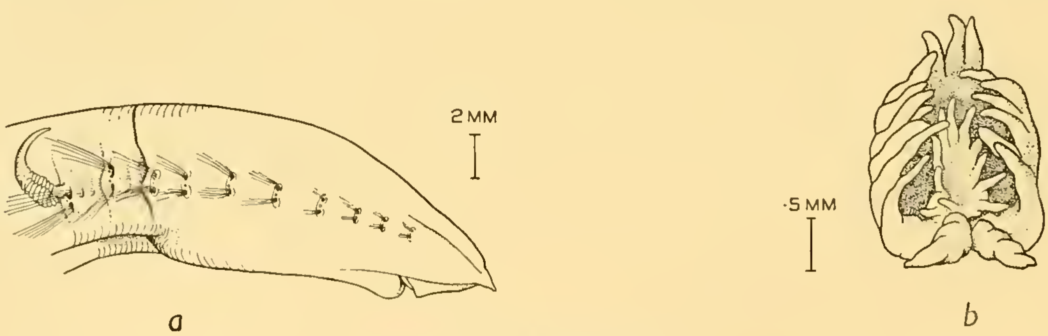

Fig. 29. *Ophelia bipartita*.
a. Anterior region of body seen from side. *b*. Anal cylinder seen from behind.

The anus (Fig. 29 *b*) has a pair of stout anal papillae, which are continuations of the lateral ridges, and above these 16 slender papillae. Inside the rectum is a papillated valve. There is a lateral organ in the form of an oval pore between notopod and neuropod in every chaetiger, and nephridial pores are present from the 12th to the 16th chaetigers.

This species then has a very clearly separated anterior region of eight chaetigers, the first nine and the last five chaetigers abranchiate and an intermediate branchiate region of 17 chaetigers.

Remarks. This species is very close both to the European *O. neglecta*, Schneider, and to the South Australian *O. dannevigi*, Benham. *O. neglecta* has 32 chaetigers and 18 pairs of branchiae. Moreover, the ventral groove begins at the 10th chaetiger and not

at the 8th as in the present species. *O. dannevigi* has 19 branchiate segments, and according to Benham the ventral groove is continued as far forward as the head, though it does not attain its full width till the 10th chaetiger. This distinguishes it from the present species in which the ventral groove begins suddenly at the 8th chaetiger. The *Thoracophelia furcifera* of Ehlers is a different species with bifid gills.

Family MALDANIDAE

1. Head without a cephalic border... ... ... *Lumbriclymenella*
   A cephalic border present 2
2. Ventral acicular bristles in the first few chaetigers ... ... *Clymene*
   No anterior ventral acicular bristles 3
3. Ventral uncini present in 1st chaetiger... ... ... *Axiothella*
   Uncini begin on the 2nd chaetiger 4
4. Cephalic keel long, high and convex ... ... *Maldane*
   Cephalic keel short and flat ... ... *Asychis*

Genus Clymene, Savigny

An oblique, bordered cephalic plate. Nuchal organs more or less parallel. Acicular ventral bristles in the first three chaetigers. Dorsal bristles of two kinds. Pygidium funnel-shaped and bordered with cirri.

Anus sunk at the bottom of the pygidial funnel; all anal cirri equal: subgenus *Isocirrus*.

Clymene (Isocirrus) yungi (Gravier).

Isocirrus yungi, Gravier, 1911, p. 122, pl. ix, fig. 109; pl. x, figs. 115–120.
Benham, 1921, p. 106.
Monro, 1930, p. 171.

OCCURRENCE. St. 144 (1); 190 (1).

SPECIFIC CHARACTERS. There are 18 chaetigers and six achaetous ante-anal segments. The cephalic plate is almost at right angles to the main axis of the body. There is no cephalic keel. There is a pair of slightly divergent hook-shaped nuchal organs, in length rather less than half that of the cephalic plate. Behind the nuchal organs the plate is ridged transversely. The border is narrow and incised laterally. The part behind the lateral incisions is crenate.

For the first eight or nine chaetigers there are well-developed prechaetal glandular bands, which in contracted specimens to some extent overlap the hinder borders of the preceding segments. Farther back the prechaetal glandular bands diminish, but the uncinigerous glandular pads increase in size and in the hinder region are very prominent.

The first three chaetigers carry bundles of dorsal bristles and ventrally two or three stout acicular bristles. The hooks begin at the 4th chaetiger. The dorsal bristles are of two kinds: (1) narrowly bordered bristles with barbed tips, and (2) capillary barbed bristles. The hooks have about four teeth above the main fang.

The achaetous, ante-anal region is rather short, being equal in length to about the last three chaetigers. The anus lies at the bottom of the anal funnel, which is surrounded by a circlet of about 30 short, equal cirri.

Genus Axiothella, Verrill

A bordered cephalic plate. Nuchal organs long, more or less parallel. Ventral denticulated uncini present from the 1st chaetiger. Anus conical, protuberant, surrounded by a short funnel fringed with unequal cirri.

Axiothella antarctica, Monro (Fig. 30).

Monro, 1930, p. 175, fig. 72 *a–c*.
Augener, 1932 *a*, p. 49.

OCCURRENCE. St. 167 (3).

REMARKS. A few fragments come from the same station as that from which most of the type-material was collected. Unfortunately no complete specimen has yet been obtained, so that a precise specific diagnosis cannot be made. Among these fragments is one posterior end which shows five ante-anal achaetous segments and a pygidium (Fig. 30). The anus consists of a short cone surrounded by a circlet of about 15 short, more or less equal cirri, and at the most ventral point there is a long flagelliform cirrus. Augener regards this species as close to *Clymene minor* (Arwidsson). The latter species has a very different head with short nuchal organs, and the anterior border of the 4th chaetiger overlaps the 3rd chaetiger. Moreover, the anterior ventral acicular bristles of the first three chaetigers are different from the hooks of the present species.

Fig. 30. *Axiothella antarctica*. Pygidium seen from the side.

Genus Maldane, Grube

Head in the form of a convex keel. There is a border divided into three sections by a pair of deep lateral incisions. Nuchal organs short, more or less straight. Dorsal bristles of three kinds. Ventral uncini, absent from the 1st chaetiger, begin on the 2nd. Anus dorsal. Pygidium in the form of an oval, bordered plate. The border is normally incised laterally and has the ventral region smooth or crenate.

Maldane sarsi, Malmgren, var. antarctica, Arwidsson.

Arwidsson, 1911, p. 32, pl. i, figs. 23–26; pl. ii, figs. 50–54.

OCCURRENCE. St. 167 (1).

SPECIFIC CHARACTERS. Nineteen chaetigers and two ante-anal achaetous segments. Prostomium rounded. A long and very high cephalic keel. Nuchal organs short, divergent and slightly curved. Cephalic border incised laterally, otherwise entire.

Anterior region unpigmented. A glandular crescent on the dorsal surface of the 5th chaetiger. Dorsal bristles of three kinds: (1) geniculate bristles with broad wings, (2) straight, bilimbate bristles with long barbed tips, (3) delicate, capillary, barbed bristles. There are no ventral hooks or bristles in the 1st chaetiger. The remaining neuropods carry rows of hooks.

Anus dorsal. Anal plate slightly oblique with the border laterally incised. The ventral section of the border is either smooth or slightly crenate.

REMARKS. Arwidsson separates this variety from the northern stem-form on slight differences in the distribution of the glandular areas on the ventral surface of the anterior region, and on the relative shortness of the main fang of the hooks. The grounds of separation seem very slight.

Genus Lumbriclymenella, Arwidsson

Head without a cephalic border. Nuchal organs V-shaped. Ventral acicular bristles in the first four chaetigers. Dorsal bristles of two kinds. Pygidium obliquely truncated with no cirri, plate or border. Anus more or less dorsal.

Lumbriclymenella robusta, Arwidsson.

Arwidsson, 1911, p. 3, pl. i, figs. 1–4; pl. ii, figs. 32–36.
Fauvel, 1916, p. 456.

OCCURRENCE. St. WS 765 (3); WS 771 (3); WS 877 (1 juv.).

SPECIFIC CHARACTERS. A rather slender species measuring 2–3 mm. in breadth. None of my specimens is complete. The dorsal surface of the anterior end is strongly pigmented with reddish brown colour. The nuchal organs are V-shaped. There are 19 chaetigers and three achaetous ante-anal segments. The first four chaetigers have ventral acicular bristles in place of hooks. The dorsal bristles are of two kinds, a rather shorter kind with the border more developed on one side than on the other, and a longer, more slender kind with striated tips. The ventral hooks show about three teeth in profile above the main fang.

The anus is upturned and dorsal and beyond it there extends ventrally a short tongue-shaped process.

REMARKS. As Fauvel has already pointed out, the genus *Lumbriclymenella* is distinguished from *Lumbriclymene* only by the possession of V-shaped instead of U-shaped nuchal organs and a rather more dorsal anus, characters which are scarcely of generic status.

Genus Asychis, Kinberg

Head an oval or rounded plate fringed by a border divided into three sections by a pair of deep lateral incisions. No raised keel. Nuchal organs large and curved. Dorsal bristles of three kinds. Uncini, absent from the 1st chaetiger, begin on the 2nd. Achaetous, ante-anal region rudimentary. Anus dorsal. Pygidium in the form of a slanting plate fringed by a border divided by a pair of lateral incisions. The border may be smooth or crenate.

Asychis amphiglypta (Ehlers) (Fig. 31).

Maldane amphiglypta, Ehlers, 1897, p. 119, pl. viii, figs. 187–193.
Asychis amphiglypta, Arwidsson, 1911, p. 35, pl. i, figs. 27–31; pl. ii, figs. 55–58.
Monro, 1930, p. 172.

OCCURRENCE. St. 30 (4); WS 777 (5).

Specific characters. Up to about 230 mm. in length. The head is very oblique. Border of cephalic plate divided into three lobes by two profound lateral notches. Hinder border smooth. Nuchal organs long, shaped like a fishhook. There are 19 chaetigers: the buccal and anal segments alone are achaetous. There are no hooks in the first chaetiger. Dorsal bristles of three kinds: (1) stout, narrowly bordered bristles with long, slender, barbed tips; (2) short bristles with broad wings and delicate smooth tips; (3) fine barbed capillary bristles. The ventral hooks have strong subrostral barbules, a row of four parallel teeth, two large and two small above the main fang, and above these a number of denticles.

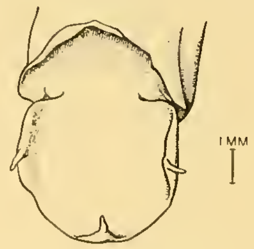

Fig. 31. *Asychis amphiglypta.* Anal plate.

The anal plate is very oblique. Ventrally it forms a deep hood or pouch separated by profound lateral incisions from the more dorsal part of the plate. Just above the lateral notches the border forms a pair of lobes which in some of these specimens are pinched out in the middle into a pair of small cirri; and again the border at its most dorsal and terminal point usually forms a small peak which in some specimens narrows down to a small cirrus. In fact there may or may not be three small cirri, a pair of lateral and a terminal cirrus, arising from the border of the anal plate (Fig. 31).

Family SABELLARIIDAE

With 3 rows of paleae	*Sabellaria*
With 2 rows of paleae	*Idanthyrsus*

Genus Sabellaria, Lamarck

Opercular peduncles more or less fused. Three concentric rows of paleae. No dorsal hooks. A pair of slender palps and sometimes a median tentacle. Numerous filiform tentacles on the ventral face of the peduncles. First and second segments with a bundle of capillary chaetae. Three biramous parathoracic segments. Falciform dorsal branchiae. In the abdominal region the dorsal rami carry small uncini and the ventral capillary bristles. A smooth, achaetous cauda.

Opercular peduncles completely fused: Subgenus *Phragmatopoma*

Inner paleae slender, distally elongate	*S.* (*Phr.*) *moerchi*
Inner paleae stout, roughly funnel-shaped	*S.* (*Phr.*) *antipoda*

Sabellaria (Phragmatopoma) antipoda, Augener.

Sabellaria antipoda, Augener, 1926, p. 221, fig. 16 *a-c*.

Occurrence. St. 936, New Zealand (1).

Specific characters. A single very small specimen in poor condition. It measures 8 mm. by 0·5 mm. with a cauda 1 mm. in length. The opercular peduncles appear to be completely fused and the opercular crown is only slightly oblique. There are three concentric rows of opercular paleae which correspond closely to Augener's figures. The geniculate outer paleae have a rather long and narrow shield ending in the middle in a

kind of delicate plume, at each side of which there are three or four teeth. The distal part of the middle paleae is in the form of a tapering, elongated hook. The inner paleae have the curious almost funnel-shaped appearance figured by Augener. There are only three parathoracic segments.

REMARKS. The condition of my material precludes my adding anything to Augener's description. The combination of the slender middle paleae with the curious very stout inner paleae appears to be characteristic.

Sabellaria (Phragmatopoma) moerchi (Kinberg).

Kinberg, 1867, p. 349.
Johansson, 1926, p. 4, fig. 1 (2–8); and 1927, p. 101.

OCCURRENCE. St. WS 762 (4).

SPECIFIC CHARACTERS. The largest specimen measures 15 mm. for the body and 4 mm. for the cauda, with a breadth of 2 mm. at the widest part for about 32 chaetigers. The opercular peduncles are completely fused and the circular crown of paleae is very slightly truncated obliquely. The small, pale yellow, geniculate, shovel-shaped outer paleae form a fringe round the large dark brown middle paleae, which completely hide the slender golden inner paleae. The paleae are figured by Johansson (*loc. cit.*, figs. 2–4). The outer paleae consist of rectangular shields which curve sharply outwards and upwards away from the slender basal spine. Apically the shield gives off three processes, a large central comb-like process and a pair of claw-like processes at the sides. The middle paleae are large spines, delicately striated transversely, with a basal piece coming off at right angles a short distance above the outer end. The inner paleae are in shape similar to the middle paleae, but very much thinner and more delicate.

I can see no median tentacle. Otherwise the arrangement of the palps, buccal veil, buccal lobes, etc., shows nothing characteristic. The opercular peduncle is long, the distance from the mouth to the operculum being about equal to that from the mouth to the end of the parathoracic region. There are no dorsal hooks, but on opening up the opercular peduncle from the dorsal surface four groups of hooks can be seen, each group consisting of a pair of paleae resembling the middle and inner paleae of the operculum. The paleae point forwards towards the operculum. The groups are arranged in two pairs, one behind the other, and the hooks of the hinder pair are smaller than those in front. The bristles of the first chaetiger are arranged in a fan-shaped transverse row. About the last 15 chaetigers are abranchiate.

REMARKS. I can find nothing significant to distinguish this species from Johansson's account of Kinberg's *Phragmatopoma lapidosa*. Gravier's Peruvian *Sabellaria fauveli* is also synonymous. Johansson claims that Grube's *Sabellaria castelnaui* also belongs here, but Augener who has examined the type and figured the paleae shows an outer palea without the lateral claws at the apex which is more like that of *Sabellaria virgini*, Kinberg, as redescribed by Ehlers. Augener has, however, pointed out that the outer paleae in the two species differ. Moreover, certain differences in the processes at the apex of the outer paleae are all that I can find to distinguish *virgini* from the present species.

Genus Idanthyrsus, Kinberg

Opercular peduncles long, more or less separate. Two rows of paleae. Dorsal hooks present. A pair of slender palps and usually a median tentacle. Numerous filiform tentacles on the ventral face of the peduncles. First and second segments with a bundle of capillary bristles. Three biramous parathoracic segments. Cirriform dorsal branchiae. In the abdominal region the dorsal ramus carries small uncini and the ventral capillary bristles. A smooth, achaetous cauda.

Idanthyrsus armatus, Kinberg.

Pallasia sexungula, Ehlers, 1897, p. 125, pl. viii, figs. 194–202.
Idanthyrsus armatus, Johansson, 1927, p. 90; Monro, 1930, p. 177, fig. 73.

Occurrence. St. WS 216 (numerous); WS 223 (10); WS 243 (4, with tubes); WS 244 (1); WS 755 (3); WS 785 (3); WS 788 (1); WS 796 (10); WS 797 (4); WS 801 (6); WS 805 (4); WS 807 (3); WS 813 (6); WS 814 (2); WS 825 (2); WS 851 (1); WS 866 (2); WS 867 (5).

Specific characters. Two rows of paleae. The opercular peduncles are completely separate. The opercular crown is very obliquely truncated. The paleae are golden and the outer row consists of long pinnate paleae of a characteristic appearance (*vide* Monro, *loc. cit.*, fig. 73). The inner paleae are long smooth hooks with narrow transverse striae. There are usually three (in young examples two) pairs of dorsal hooks. A median tentacle is present. Gills are absent from the last few chaetigers only.

Remarks. This species is very common in the Falkland Island area. It appears to extend a long way up the west coast of America. I have myself recorded it from Gorgona Island and Johansson is very doubtful whether Chamberlin's *I. ornamentatus* from California is separable.

Family AMPHICTENIDAE

Genus Pectinaria, Lamarck

Tentacular membrane with a denticulated edge. Dorsal border smooth or crenate. Scapha separated from the abdomen by a constriction. No eyes on the scapha. Two pairs of branchiae. A single pair of cement glands. Three pairs of nephridia, the first pair markedly longer than the rest. Dorsal bristles of two kinds. Uncini pectiniform with teeth of different sizes.

Pectinaria ehlersi, Hessle.

Pectinaria belgica, Ehlers, *nec* Pallas, 1901, p. 204.
Pectinaria ehlersi, Hessle, 1917, p. 77, pl. i, fig. 1, text fig. 3 *a–e*.
Pectinaria (*Cistenides*) *ehlersi*, Nilsson, 1928, p. 33, fig. 10 *a*, *b*.

Occurrence. St. WS 212 (1); WS 236 (1).

Specific characters. Tentacular membrane with 20–30 processes. Up to about 15 paleae on each side. Seventeen chaetigers, of which 13 (from the 4th to the 16th) are uncinigerous. Dorsal bristles of two kinds—straight, narrowly bordered bristles with delicately hirsute ends; and bristles with curved tips strongly denticulated on the concave side. In profile the uncini have four large teeth above the finely denticulated basal

region. This is the most easily appreciable difference between *ehlersi* and *belgica* which has hooks with seven to eight teeth in profile instead of four.

REMARKS. The present material consists of one ill-preserved complete specimen (St. WS 236) measuring 21 mm. by 3 mm. at the widest part, and one anterior fragment of about eight chaetigers.

Nilsson attributes this species to the subgenus *Cistenides* which he separates from *Pectinaria, sensu* Malmgren, almost entirely on the presence in the former of a granular area on the dorsal surface of the segment preceding the scapha. I am not convinced that any good purpose is served by retaining these subgenera. The rather ill-preserved scapha in the present specimen corresponds to Hessle's figure except that I cannot see the two lateral papillae at the sides of the anal ligule, and the hinder border of the latter appears to be faintly crenate and not smooth, as Hessle figures it. The tube is composed of small brown sand-grains and is very slightly curved.

Family AMPHARETIDAE

1.	Paleae present	2
	Paleae absent	3
2.	Tentacles smooth	*Amphicteis*
	Tentacles pinnate	*Ampharete*
3.	Tentacles pinnate	*Neosabellides*
	Tentacles smooth	4
4.	Prostomium trilobate	*Amage*
	Prostomium rounded, without lobes	*Phyllocomus*

Genus Ampharete, Malmgren

Prostomium distinctly trilobate, without raised glandular bands. Tentacles pinnate. Branchiae four pairs. Paleae well developed. First notopod reduced. No dorsal cirri in the thoracic region, but present in the form of small tubercles in the abdominal region. Often small neuropodial cirri above the pinnules in the abdominal region. Anal cirri present.

Ampharete kerguelensis, McIntosh.

McIntosh, 1885, p. 426, pl. xlvii, fig. 10; pl. xxvia, figs. 22–24.
Hessle, 1917, p. 100.
Augener, 1926, p. 223 and 1932 *a*, p. 57.

OCCURRENCE. St. WS 177 (4).

SPECIFIC CHARACTERS. The largest specimen measures 20 mm. by 2 mm. The two groups of gills are joined across the back by a transverse fold of the integument.

The rather blunt apexes of the paleae are surmounted by delicate filiform tips. There are 14 pairs of thoracic notopods and 12 of abdominal neuropods. The dorsal cirri in the abdominal region are very little developed and there are apparently no neuropodial cirri. The bristles are bordered capillaries, and the thoracic hooks have two vertical rows each of five to six teeth: the abdominal hooks have three vertical rows each of about five teeth. The anus is papillated.

Genus Amage, Malmgren

Body rather stout. Prostomium clearly trilobate, with raised glandular ridges. Tentacles smooth. Branchiae three to four pairs. No paleae. First and second notopods sometimes reduced. Dorsal cirri present in the thoracic region and both dorsal and neuropodial cirri in the abdominal region. Uncini begin on 4th chaetiger.

Amage sculpta, Ehlers.

Ehlers, 1908, p. 141, pl. xx, figs. 1–9.
Hessle, 1917, p. 121.
Monro, 1930, p. 180.

Occurrence. St. 182 (1); 366 (3).

Specific characters. These specimens are in poor condition. Body thick and slug-like, sharply tapered posteriorly. Up to about 30 mm. in length by 6 mm. at the widest part. The gills are not fused basally and the two groups of four gills are clearly separated. There are 14 pairs of thoracic notopods, of which the first two pairs have the bristles more or less inclosed within the notopodial lobes. There are 10 pairs of abdominal neuropods. The dorsal cirri are well developed, especially in the abdominal region where they are clavate. Small neuropodial cirri are also present in the hinder region. The bristles are bordered capillaries. The hooks have usually four teeth in profile, all the teeth being single except those of the third row which are double or paired. One of the specimens from St. 366 shows five teeth in profile with paired teeth in the fourth row. There appears to be a pair of short dorsal anal cirri.

Genus Phyllocomus, Grube

Prostomium rounded, not distinctly trilobate. No raised glandular bands. Tentacles smooth. Four pairs of gills. No paleae. Dorsal cirri present in thoracic region and both dorsal and neuropodial cirri in the abdominal region. No reduction of the notopods in the first two chaetigers. Anus surrounded by a circlet of large papillae or cirri.

Phyllocomus crocea, Grube.

McIntosh, 1885, p. 427, pl. xlvii, fig. 11; pl. xxviA, fig. 25; pl. xxxviiA, fig. 6.
Hessle, 1917, p. 123.
Monro, 1930, p. 181, fig. 75 *a–c*.
Augener, 1932A, p. 82, fig. 10 *a*, *b*.

Occurrence. St. 363 (4); 371 (2); WS 877 (1).

Specific characters. Up to 83 mm. in length. The cephalic lobe is rounded and not distinctly trilobate. It is usually splashed with dark red pigment. There is a pair of crescentic nuchal organs. There are four pairs of gills. The two outer pairs consist of a rounded central axis on each side of which is a membrane. The two inner pairs have four membranes coming off from the central axis. There is considerable variation in the width of the branchial membranes especially in the outermost pair of gills. There are 15 pairs of thoracic notopods and about 45 pairs of abdominal neuropods. Dorsal cirri are well developed in the anterior abdominal region, but decrease in size posteriorly.

Neuropodial cirri more prominent in the hinder abdominal region than in the anterior. The bristles are bordered capillaries with a curious third flange and the hooks have five teeth in a single row. The anus is surrounded by a circlet of cirri of different lengths.

REMARKS. Augener is sceptical of the existence of the third flange on the bristles as figured both by Benham (1921, p. 98) and myself. I have examined the bristles of the present specimens and careful focussing shows a projecting rib or flange running down the middle of the lower part of the bristles. I am inclined to agree with Augener that Benham's (*loc. cit.*) *P. dibranchiata* belongs to this species.

Genus Neosabellides, Hessle

Prostomium not distinctly trilobate, without raised glandular bands. Tentacles pinnate. No paleae. No parapodia on the third segment. Branchiae three pairs. No dorsal cirri in the thoracic region; in the abdominal region they are only slightly developed. Neuropodial cirri on a certain number of abdominal segments. There is a pair of anal cirri.

Neosabellides elongatus (Ehlers).

Sabellides elongatus, Ehlers, 1913, p. 551, pl. xlii, figs. 1–6.
Neosabellides elongatus, Hessle, 1917, p. 104.

OCCURRENCE. St. WS 177 (3).

SPECIFIC CHARACTERS. About half a dozen long, very slender tubes of green mud, from which I have extracted three specimens. The largest measures 25 mm. by 1 mm. The two groups of gills are well separated. There are 14 pairs of thoracic notopods and 19 of abdominal neuropods. These specimens are sexually mature and the abdominal region has the body wall very thin and distended with eggs or sperm. In these specimens I cannot see either the dorsal or the neuropodial cirri in the hinder region. According to Hessle the last 17 neuropods have small, stumpy neuropodial cirri. The bristles are bordered capillaries. In the thoracic region the hooks have two vertical rows each of four teeth, and in the abdominal region they have three vertical rows each of four to five teeth. The anus is papillated and there is a pair of anal cirri.

Genus Amphicteis, Grube

Prostomium clearly trilobed, with two raised glandular bands. Tentacles smooth. Branchiae four pairs. Paleae well developed. Seventeen thoracic chaetigers. Uncini from the 4th chaetiger. A stout dorsal cirrus in the thoracic and in the abdominal regions and usually a neuropodial cirrus in the abdominal region. A pair of anal cirri.

Paleae much longer than the dorsal bristles... ... ... *A. gunneri*, var. *antarctica*
Paleae rather shorter than the dorsal bristles ... ... *A. philippinarum*

Amphicteis philippinarum, Grube.

Hessle, 1917, p. 118, text-fig. 22 *a*, *b*.
Augener, 1926, p. 228.

OCCURRENCE. St. 936, New Zealand (1); 939, New Zealand (1).

Specific characters. The larger specimen measures 11 mm. by 1·5 mm. I believe these examples to be conspecific with those New Zealand specimens attributed with a query by Augener to Grube's species. They seem to agree fairly closely with Hessle's account. The paleae are short, scarcely longer than the dorsal bristles, stout and end in hair-like tips longer than that shown in Hessle's figure. There are 17 pairs of thoracic notopods and 15 of abdominal neuropodial pinnules. The dorsal cirri in both regions of the body are only slightly developed and the abdominal neuropodial cirri are prominent.

The bristles are bordered capillaries and the hooks have a single row of five to six teeth. In the present specimens five is the maximum number that I have seen. The most characteristic feature is the shortness of the rather stout paleae, but this should be treated with caution as the paleae appear to be capable to a large extent of retraction within the body-wall. Moreover, the hinder neuropodial cirri are relatively very much longer than they are for example in *A. gunneri*.

Amphicteis gunneri (Sars), var. **antarctica**, Hessle.

Hessle, 1917, p. 116.

Occurrence. St. 167 (3); 368 (numerous); 652 (1).

Specific characters. Paleae very much longer than the dorsal bristles. They end in long, finely drawn out tips. There are 17 pairs of chaetigerous notopods and 15 uncinigerous abdominal segments. Gills arranged in two groups of four, clearly separated by a fold of integument. In the thoracic region the uncini begin at the 4th chaetiger. The bristles are bordered capillaries and the hooks have five to seven teeth in a single row. Dorsal cirri of rudimentary notopods in abdominal region prominent. There is also a small dorsal cirrus at the top of the uncinigerous pinnules in the hinder region. Separated from the stem-form on the ground that the terminal plume of the paleae is more sharply pinched off from the body of the bristles, and that the dorsal cirri of the rudimentary notopods in the abdominal region are longer and more prominent.

The animal builds a thick tube of mud on a membranous lining.

The grounds of separation of the variety from the stem-form are very slender.

Family TEREBELLIDAE

1.	Bristles and hooks absent	*Hauchiella*
	Bristles and hooks present	2
2.	Thoracic and abdominal uncini of two distinct types...	*Octobranchus*
	Thoracic and abdominal uncini of one type	3
3.	Uncini in two rows over a number of thoracic segments	4
	Uncini in single rows throughout the body	10
4.	Uncini of first few segments with long chitinous prolongations	*Pista*
	Anterior uncini without chitinous prolongations	5
5.	Uncini pectiniform, set back to back	*Loimia*
	Uncini avicular	6
6.	No branchiae	*Leaena*
	Branchiae present	7

7. Lateral lobes on the first few segments... 8
No lateral lobes on the first few segments 9
8. Dorsal bristles with denticulated ends ... ... *Amphitrite*
Dorsal bristles smooth ... ... *Polymnia*
9. Notopods begin on third segment. Dorsal bristles with denticulated ends... ... *Neoleprea*
Notopods begin on fourth segment. Dorsal bristles smooth... ... ... *Nicolea*
10. Prostomium enlarged, lobed. No branchiae ... ... *Polycirrus*
Prostomium without lobes. Filiform branchiae present 11
11. Notopods begin on second segment ... ... *Streblosoma*
Notopods begin on third segment ... ... *Thelepus*

Subfamily *AMPHITRITINAE*

Tentacular lobe of head not enlarged. Uncini in double rows over a certain number of segments.

Genus Amphitrite, O. F. Müller

Two, or more commonly three pairs of branchiae, usually ramified, exceptionally cirriform and arising from a common base. Lateral lobes present in the anterior region. The notopods begin at the fourth segment and the neuropods at the fifth. The bristles have denticulated tips. The hooks are in double rows over a certain number of segments.

A high dorsal collar on the fourth segment ... ... *A. kerguelensis*
No dorsal collar on the fourth segment ... ... *A. affinis*, var. *antarctica*

Amphitrite kerguelensis, McIntosh.

Hessle, 1917, p. 186, with synonymy.

Occurrence. St. 599 (1); WS 228 (1); WS 248 (1).

Specific characters. Three pairs of gills, of which the third pair is attached to a high dorsal collar on the fourth segment. Well-developed lateral lobes on the second, third and fourth segments. About 13 ventral gland shields. The notopods begin on the fourth segment and there are 17 pairs. The bristles are bordered and have denticulated tips. The hooks begin on the fifth segment, and are in double rows from the seventh to the sixteenth unciniger. There are about three rows of teeth above the main fang.

Amphitrite affinis, Malmgren, var. **antarctica**, var.nov.

Amphitrite edwardsi, Monro, *nec* Quatrefages, 1930, p. 189, fig. 79 *a–c*.

Occurrence. St. WS 225 (1); WS 583 (1); WS 765 (3 juv.); WS 785 (3); WS 801 (2); WS 804 (5).

Specific characters. Differs from the stem-form in that the gills are more richly branched, the lateral lobes of the fourth segment are only very slightly developed, and the nephridia extend from segments 3 to 12 instead of from 3 to 8.

With more material at my disposal I have come to the conclusion that this is a southern variety of the northern and Arctic *A. affinis*. A fully grown example may measure as much as 120 mm. in length for about 90 chaetigers, but the present form is closer to *affinis* than to *edwardsi* in size. Unfortunately the only specimens in the Museum collection labelled *affinis* are of little use for purposes of comparison, and I have relied on a comparison of the present specimens with Fauvel's (1927, p. 246, fig. 84 *k, l*) account of the northern form.

The thorax is thick and arched dorsally. There are no eye-spots. There are large lateral flaps on the second and third segments and a small one on the fourth. There are 11 ventral gland shields. Each of the three pairs of gills consists of a pair of stout and richly branched trunks. The nephridia extend from the third to the twelfth segments. There are 17 thoracic notopods. The dorsal bristles have distinct borders and a long denticulated apex. The double rows of hooks extend from the seventh to the sixteenth uncinigers. The hooks have about six rows of teeth above the main fang. Posteriorly the abdominal tori are gradually transformed into narrow pinnules.

REMARKS. I suspect that *Amphitrite variabilis*, Risso of Ehlers (1901, p. 208), from Puerto Condor belongs here.

Genus Leaena, Malmgren

No gills. The anterior segments are usually furnished with lateral lobes. The notopods begin on the fourth segment and the neuropods on the fifth. The dorsal bristles are smooth and widely bordered. The hooks are in two rows from about the eleventh to the twentieth segment.

10–11 thoracic chaetigers ... ... *L. abranchiata*, var. *antarctica*
17 thoracic chaetigers ... ... *L. collaris*

Leaena abranchiata, Malmgren, var. antarctica, McIntosh.

Hessle, 1917, p. 197.
Benham, 1927, p. 106.
Leaena antarctica, McIntosh, 1885, p. 462, pl. xlviii, figs. 9 and 10; pl. xxviiiA, figs. 10 and 11.

OCCURRENCE. St. 45 (1).

SPECIFIC CHARACTERS. A single, damaged, immature specimen measuring about 10 mm. by 1 mm. No eye-spots. Lateral lobes on the second, third and fourth segments. Those on the fourth segment very little developed. The third segment has a low and inconspicuous collar on the dorsal surface. There are 10–11 thoracic chaetigers and about 10 ventral gland shields. The bristles have broad wings and long and fine tips. Above the main fang of the hooks there is a row of teeth surmounted by about three rows of denticles.

Leaena collaris, Hessle.

Hessle, 1917, p. 198, pl. ii, figs. 9, 10, text-fig. 52 *a–c*.
Monro, 1930, p. 188.

OCCURRENCE. St. 123 (1); MS 15 (3).

SPECIFIC CHARACTERS. One specimen from St. MS 15 is very large and measures about 70 mm. by 4 mm. at the widest part for 55 chaetigers. There are no eye-spots. Lateral lobes present on the second, third and fourth segments. The third segment has a well-developed lobed or crenate collar on the dorsal surface. There are 17 thoracic chaetigers and 11 ventral gland shields. The bristles have wide wings and very long and fine tips. The hooks have four or five rows of small teeth above the main fang.

REMARKS. The larger specimens from St. MS 15 have two rows of very conspicuous, oval, white, glandular pads lying just above and between the notopods of the first 12 chaetigers. These are not apparent in the small specimen from St. 123, which measures only 25 mm. in length. Their development is probably related to sexual maturity.

Genus Nicolea, Malmgren

Two pairs of ramified branchiae. No lateral lobes on the anterior segments. 15–22 thoracic chaetigers. Notopods begin on the fourth segment and neuropods on the fifth. The bristles are smooth. The hooks are in double rows over a certain number of segments.

Nicolea chilensis (Schmarda).

Hessle, 1917, p. 172.
Monro, 1930, p. 191.

OCCURRENCE. St. 936, New Zealand (2); WS 755 (5); WS 756 (3); WS 762 (8).

SPECIFIC CHARACTERS. Eye-spots present. The New Zealand specimens (St. 936) and the specimens from St. WS 762 have 17 thoracic chaetigers and those from the other two stations have 18 thoracic chaetigers. There are 17 ventral gland shields. No lateral lobes anteriorly. The bristles are bordered and smooth. The hooks have above the main fang a row of between two and five transverse teeth surmounted by a few denticles.

REMARKS. From the material of the Swedish Southpolar Expedition Hessle records some specimens with 18 thoracic chaetigers and others with 17. Augener, on the other hand, found 18 to be the constant number of thoracic chaetigers in his New Zealand specimens. Hessle includes within *chilensis* the specimens from Auckland Island attributed by Ehlers to this species. Ehlers states that the number of thoracic chaetigers varies between 17 and 22. I have examined these specimens and actually out of the ten specimens five have 20 thoracic chaetigers, two have 21, the twenty-first being much reduced, one has 19 and the neuropod of the twentieth intermediate in form between those of the thorax and of the abdomen, and two have 18. The two last probably belong to *chilensis* and the remainder to Augener's *N. maxima*, which appears to be a good species and constantly has two or three more thoracic chaetigers than *chilensis*.

The position of *chilensis* does not seem to me quite satisfactory because a *chilensis* with 17 thoracic chaetigers is very difficult to distinguish from the European *N. venustula*. According to Hessle the nephridial papillae in *chilensis* are chimney-shaped in both sexes, whereas in *venustula* they are long and cirriform in the male and short and chimney-shaped in the female. There appears to be little else to distinguish the two forms.

Genus Polymnia, Malmgren

Three pairs of ramified branchiae. Lateral lobes present on the anterior segments. The first notopods are on the fourth segment and the first neuropods on the fifth. The bristles are smooth and the hooks are in double rows over a certain number of segments.

Polymnia nebulosa (Montagu).

Fauvel, 1927, p. 257, fig. 89 *a–g*.

Occurrence. St. WS 840 (5).

Specific characters. A very conspicuous dark band of eye-spots across the cephalic lobe. Lateral lobes on the second, third and fourth segments. Seventeen thoracic chaetigers. Bristles narrowly bordered and smooth. Hooks in double rows from the seventh to the sixteenth unciniger. Above the main fang there is a pair of large parallel teeth surmounted by a crest of one to five denticles.

Remarks. I have compared these specimens with some European examples of this species and I can find no grounds for separation. *P. nebulosa* has an almost cosmopolitan distribution, but to the best of my knowledge this is the first record of it as far south as the Falkland Islands.

Genus **Neoleprea**, Hessle

Two pairs of ramified gills. No lateral lobes in the anterior region. The notopods begin on the third segment and the neuropods on the fifth. The bristles have strongly denticulated tips. The hooks are in double rows over a certain number of segments.

Neoleprea streptochaeta (Ehlers).

Leprea streptochaeta, Ehlers, 1897, p. 130, pl. viii, figs. 203–205.
Neoleprea streptochaeta, Hessle, 1917, p. 192.

Occurrence. St. WS 583 (1).

Specific characters. Two pairs of richly branched gills. No eye-spots. 17–18 pairs of thoracic notopods. About 13 gland-shields. The dorsal bristles are characteristic. They are geniculate with twisted and denticulated tips. The hooks are in single rows on the first eight tori, behind which they are in double rows in all except the last few segments. There are two or three rows of teeth above the main fang of the hooks.

Genus **Loimia**, Malmgren

Three pairs of ramified gills. There are lateral lobes in the anterior region. The notopods begin on the fourth segment and the neuropods on the fifth. The bristles are smooth and the hooks are pectiniform and set back to back.

Loimia medusa, Savigny? juv.

Loimia montagui (Grube), Monro, 1930, p. 186.
Loimia medusa? Monro, 1931, p. 212, fig. 1.

Occurrence. St. 413 (15); 446 (20); 448 (3).

Specific characters. These small, postlarval, pelagic terebellids are exactly similar to the specimen described by me (*loc. cit.*, 1931) from St. 102 in the middle of the South Atlantic. They measure about 15 mm. in length and the third pair of gills is just beginning to appear. There are five or six teeth to the thoracic hooks. I have already expressed the opinion that these specimens are identical with Agassiz's larva which Fauvel in 1907 suggested might be that of *L. medusa*.

Genus Pista, Malmgren

One to three pairs of branchiae with a well developed main trunk. Lateral lobes in the anterior region. Notopods begin on the fourth segment and neuropods on the fifth. Bristles smooth. In the first few neuropods the hooks have long shafts. In the rest of the body they are avicular and in double rows over a certain number of segments.

Pista mirabilis, McIntosh.

McIntosh, 1885, p. 454, pl. li, figs. 1, 2; pl. xxviiA, fig. 34; pl. xxxviiiA, fig. 2.
Scione mirabilis, Benham, 1921, p. 85, pl. ix, figs. 97–100.
Pista mirabilis, Benham, 1927, p. 99, with synonymy.
Monro, 1930, p. 186, fig. 76.
Scione spinifera, Ehlers, 1908, p. 152, pl. xx, figs. 10–14.
Pista spinifera, Augener, 1932A, p. 60.

OCCURRENCE. St. 363 (1); WS 244 (2 with cluster of tubes); WS 245 (numerous); WS 246 (1); WS 871 (numerous with tubes).

SPECIFIC CHARACTERS. A single pair of gills. Large lateral flaps on the third segment and small ones on the fourth. There are 17 thoracic chaetigers and the gland shields extend to about the thirteenth. The bristles are narrowly bordered capillaries. The special hooks of the first thoracic torus have very long shafts and no denticles above the main fang. The normal uncini of the rest of the body have two to three rows of denticles above the main fang. The tubes are made of mud in which bundles of sponge spicules are usually embedded, and are furnished externally with characteristic spine-like processes.

REMARKS. Augener (*loc. cit.*) is not convinced that McIntosh's *mirabilis* and Ehlers's *spinifera* are identical. I have examined the hooks of the first thoracic torus in one of McIntosh's type specimens and they show the characteristic long shaft and absence of denticles above the main tooth. As Augener has pointed out, the main tooth is grooved at the sides and these grooves are probably equivalent to normal denticles.

In a specimen from WS 244 I noticed in the first thoracic torus a group of about six hooks with a well-developed second tooth above the main fang. The remaining hooks of the torus were of the typical unidentate form. This single second tooth is quite different from the row of denticles figured by Fauvel (1927, fig. 92 *e*) for the hooks of the first unciniger and I believe the *P. mirabilis*, McIntosh of Fauvel, to be a distinct form. Apart from this, the hooks of the second unciniger are not long shafted as Fauvel shows them.

Subfamily *THELEPINAE*

Tentacular lobes of prostomium not enlarged. Gills filiform and arranged in transverse rows. Uncini in single rows throughout the body.

Genus Thelepus, Leuckart

Dorsal bristles over a large number of segments. Branchiae two or three pairs, simple, cirriform not arising from a common stalk. No lateral lobes in the anterior

region. The notopods begin at the third segment and the neuropods at the fifth. Bristles smooth; hooks in single rows throughout the body.

Two pairs of branchiae ... ... *T. cincinnatus*
Three pairs of branchiae ... ... *T. setosus*

Thelepus setosus (Quatrefages).

Fauvel, 1927, p. 273, figs. 95 *a–h*.
Thelepus plagiostoma, Hessle (*nec* Schmarda), 1917, p. 214.

OCCURRENCE. St. WS 234 (1); WS 247 (1 juv.); WS 583 (1); WS 742 (4 juv.); WS 755 (3); WS 784 (2); WS 787 (1); WS 804 (1); WS 811 (4); WS 869 (4 with tubes).

SPECIFIC CHARACTERS. Three pairs of gills. Dorsal bristles on the first 30–60 chaetigers. About 20 more or less distinct gland-shields. Nephridia in segments 4–7. Abdominal region long, narrow and twisted. Towards the end of the body the uncinigerous tori form projecting, rectangular pinnules.

Thelepus cincinnatus (Fabricius).

Hessle, 1917, p. 212.
Fauvel, 1927, p. 271, figs. 95 *i–m*.

OCCURRENCE. St. 371 (numerous); WS 33 (2); WS 225 (2); WS 246 (4); WS 248 (2); WS 785 (1); WS 801 (1); WS 803 (1); WS 804 (8); WS 871 (numerous).

SPECIFIC CHARACTERS. Two pairs of gills. Eye-spots many and conspicuous. Dorsal bristles sometimes continued almost to the end of the body. Ventral gland-shields indistinct. Nephridia in segments 4–7. In the abdomen the uncinigerous tori are gradually transformed into projecting rectangular pinnules.

Genus **Streblosoma**, Sars

Dorsal bristles over a large number of segments. Two or three pairs of branchiae, each branchia consisting of several simple filiform filaments, not as a rule arising from a common base. Dorsal bristles smooth and capillary. They begin at the second segment. The hooks begin at the fifth segment (4th chaetiger). They are in single rows throughout the body.

Streblosoma bairdi (Malmgren) **var. antarctica, var.nov.** (Fig. 32 *a–f*).

OCCURRENCE. St. WS 33 (2).

SPECIFIC CHARACTERS. Of these specimens one is slightly larger than the other and measures 30 mm. by 2 mm. for about 55 chaetigers. They have 28 and 26 pairs of notopods respectively. Eye-spots are not visible. The buccal segment forms a swollen underlip. The ventral surface is glandular over about the first 20 chaetigers, but the glands are more highly developed over the first 10. Three pairs of gills composed of one or two simple filaments. Nephridial papillae not visible. Dorsal bristles capillary, of two kinds: (1) a longer kind with a narrow smooth border (Fig. 32 *a*); (2) a shorter kind apparently without a border (Fig. 32 *b*). The hooks begin at the 4th chaetiger and in the anterior region have a transverse row of two to three teeth (Fig. 32 *c*, *d*) above the main

fang and above these a very inconspicuous row of denticles; in the abdominal region the hooks (Fig. 32 *e, f*) have two transverse rows of teeth above the main fang and above these a number of small denticles. There is a well-marked subrostral prolongation. In the hinder region the tori are gradually transformed into projecting rectangular pinnules.

This variety differs from the stem-form in having the borders of the longer type of bristle apparently smooth and not striated, and the denticles of the thoracic hooks are fewer and less conspicuous.

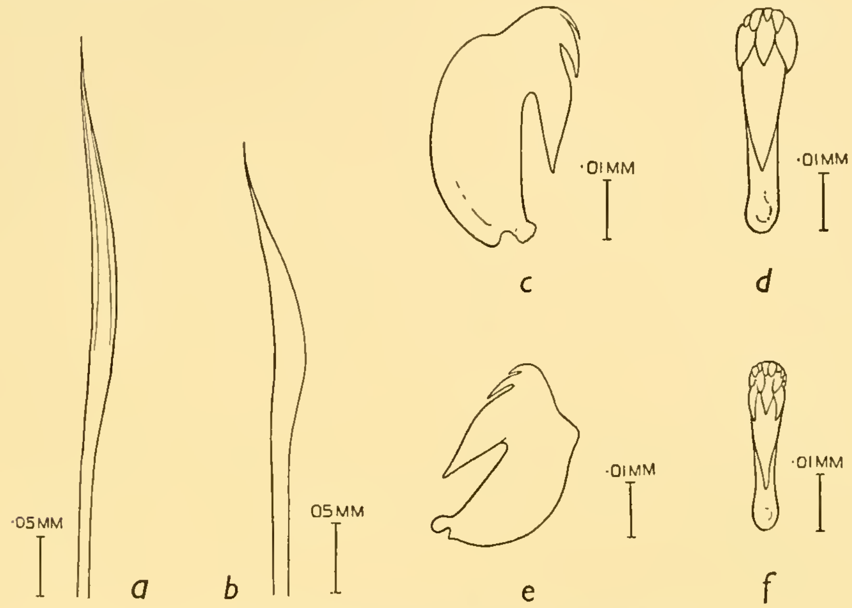

Fig. 32. *Streblosoma bairdi*, var. *antarctica*.

a. Bordered thoracic bristle.
b. Simple thoracic bristle.
c. Thoracic hook seen from side.
d. Thoracic hook seen from front.
e. Abdominal hook seen from side.
f. Abdominal hook seen from front.

REMARKS. The differences between this variety and *S. bairdi* are slight, as indeed are those between the latter and the tropical *S. verrilli*, Treadwell, of which *S. crassibranchiata*, Treadwell, is a synonym, and *S. persica* (Fauvel). There are differences in the degree of development of the branchiae and of the eye-spots, in the position of the first unciniger and in the number of denticles on the hooks, all characters subject to considerable individual variation. I am not convinced that in *S. bairdi* we do not possess a somewhat variable species that is cosmopolitan in distribution. *S. coespitosa* is distinguished by having sessile neuropods in the abdominal region.

Subfamily *POLYCIRRINAE*

Tentacle-bearing region of head enlarged to form a prominent, often folded and lobed lip bearing very numerous tentacles. No gills. Uncini, if present, in single rows throughout.

Genus Polycirrus, Grube

Prostomium a large and folded lobe bearing very numerous tentacles. No gills. The notopods begin on the second or third segment and the neuropods are very variable in their segment of origin, being sometimes altogether absent from the anterior region. The dorsal bristles are smooth or spinous. The hooks are avicular and arranged in single rows.

Dorsal bristles very narrow and bordered ... ... *P. hesslei*
Dorsal bristles with rather wide, unbordered wings ... ... *P. kerguelensis*

Polycirrus kerguelensis (McIntosh).

Ereutho kerguelensis, McIntosh, 1885, p. 474, pl. xxviiiA, figs. 20–21.
Polycirrus kerguelensis, Gravier, 1911, p. 141, pl. xi, fig. 136.
Hessle, 1917, p. 221.

Occurrence. St. 42 (2); WS 33 (1).

Specific characters. These specimens like the others recorded by me from South Georgia have 11 pairs of cirrigerous notopods and the neuropods begin behind the last notopod. There may be as many as 15 pairs of notopods, and neuropods may be present on the last two or three thoracic segments. The ventral gland shields of the first and second segments form a broad plate divided by a groove into a larger anterior and a smaller posterior part.

The lateral pads are well developed for about the first five chaetigers. The bristles have rather broad serrated wings. The hooks have in profile two teeth above the main fang.

Polycirrus hesslei, Monro.

Monro, 1930, p. 195, fig. 81 *a–c*.

Occurrence. St. WS 583 (1).

Specific characters. Cephalic lobe a trilobed, undulating membrane. Ventral glands of first, second and anterior part of third segment fused into a large roughly shield-shaped pad. About 10 pairs of ventral gland shields widely separated in the median line. Bristles begin on the second segment and there are 13 pairs of notopods with cirriform processes. The bristles are lightly bordered capillaries. The hooks begin at the 14th chaetiger, and above the main fang there is a single tooth surmounted by a row of about six denticles. There are six pairs of nephridia extending from the third to the eighth segment. They decrease in size from the first to the third pairs; the remainder are of equal size and smaller than the third pair.

Genus Hauchiella, Levinsen

No bristles or hooks. The anterior nephridia are longer than the posterior.

Hauchiella tribullata (McIntosh).

Hessle, 1917, p. 233, with synonymy.
McIntosh, 1922, p. 201, pl. cxxxviii, figs. 13, 13 *a*, *b*.
Monro, 1930, p. 197.

Occurrence. St. 123 (1).

Specific characters. No eye-spots. Ventral surface of first segment forms a lower lip. In the anterior region the segments are rather indistinctly subdivided into secondary rings. Small, rectangular ventral gland shields continued to the hinder end. Four pairs of nephridiopores of which the three hinder pairs are very large and conspicuous. Nephridia in the third, fourth, fifth and seventh segments (*vide* Hessle). The present specimen is damaged and in poor condition.

Subfamily *TRICHOBRANCHINAE*

Cephalic lobe not enlarged. Branchiae filiform. Thoracic and abdominal uncini of two distinct types. Thoracic uncini aciculiform, abdominal uncini pectiniform or avicular.

Genus **Octobranchus**, Marion and Bobretzky

The head carries only one kind of tentacle dilated at the extremity. Four pairs of simple filiform branchiae. Anterior segments carry membranous collars on the lateral and ventral surfaces. No ventral gland shields. Dorsal bristles capillary. Thoracic hooks with very long shafts, arranged in sessile tori. Abdominal hooks small, pectiniform, carried by prominent rectangular pinnules.

Octobranchus antarcticus, n.sp. (Fig. 33 *a–g*).

Occurrence. St. 182 (1).

Specific characters. The single specimen is a ripe female measuring 17 mm. by 2 mm. for 28 chaetigers. The hinder end is damaged and I cannot tell whether the specimen is complete. The tentacles are lost and all the gills except the left member of the fourth pair. In spirit there is no colour. The head has a horseshoe-shaped upper lobe without folds and ventral cushions. Dark brown eye-spots are present in a band. The buccal segment sends forward a stout under-lip. The second segment sends forward below the under-lip a ventral lappet with an uneven lobate edge. The third forms a pair of more or less spatulate ventro-lateral lappets joined by a low fold across the ventral surface. The fourth and fifth segments form enormous lateral and ventral collars, open dorsally. The 6th segment forms a pair of relatively small, rounded lappets at the sides of the body below the notopods (Fig. 33 *a*).

There are 16 thoracic chaetigers. The first notopods are on the fifth, or last branchiate, segment. The uncini begin on the fourth chaetiger or eighth segment. There are no ventral gland shields. The single branchia consists of a stout basal column surmounted by a filiform tip. The scars indicating the place of attachment of the three additional pairs of branchiae are visible on the second, third and fourth segments. As I wish to leave the only remaining branchia in place I am unable to examine its structure in detail.

The bristles are borne by prominent notopodial lobes (Fig. 33 *f*) with two lips. They are of two kinds: (1) very delicate and transparent short capillary bristles (Fig. 33 *c*); (2) larger bristles with narrow borders and long hair-like tips (Fig. 33 *d*). Both kinds are smooth. In the thoracic region the uncinigerous tori are sessile, but in the abdominal region they are from the first abdominal segment borne on prominent

rectangular pinnules. In the thoracic region the hooks (Fig. 33 *e*) have very long shafts and the head consists of a single large tooth surmounted by a crest of denticles. All the thoracic hooks appear to be of the same kind. The abdominal hooks (Fig. 33 *f*, *g*) are small and pectiniform. They have two transverse rows of four to five teeth above the main basal tooth. They are furnished with long chitinous supports (*soies de soutien*). The hinder end of the body is damaged.

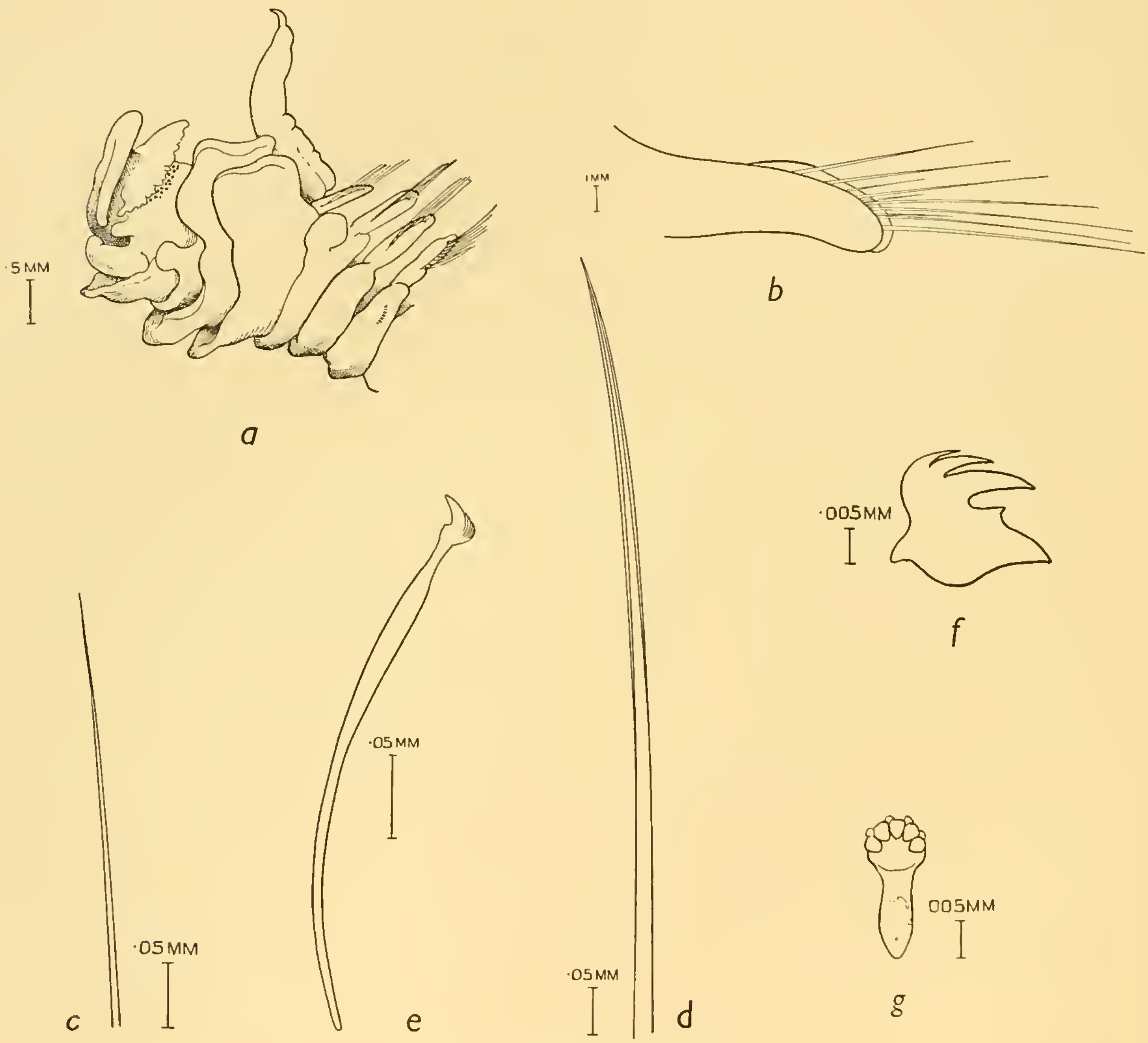

Fig. 33. *Octobranchus antarcticus.*

a. Anterior region from the side. Tentacles and all the gills except one are missing.
b. Thoracic notopod.
c. Shorter thoracic bristle.
d. Longer thoracic bristle.
e. Thoracic hook.
f. Abdominal hook seen from the side.
g. Abdominal hook seen from the front.

REMARKS. This species is based on very poor material but it nevertheless appears to be quite distinct from the other members of the genus. The first bristle-bearing segment is the fifth and not the third as in *O. lingulatus* and *O. japonicus*. Moreover, there are two distinct kinds of thoracic bristle and only one is recorded for *O. lingulatus* and *japonicus*.

Family SABELLIDAE

1.	Pickaxe bristles present in the thoracic tori	2
	Pickaxe bristles absent from the thoracic tori	3
2.	Spatulate bristles present in the thoracic notopods	*Potamilla*
	No spatulate bristles in the thoracic notopods...	*Sabella*
3.	An anal spout or gutter present...	*Euchone*
	No anal spout	4
4.	Thoracic dorsal bristles all of one type...	*Oridia*
	Thoracic dorsal bristles of two distinct types	*Chone*

Genus Sabella, Linnaeus

Branchiae not spiral, without dorsal processes or subterminal eyes. The branchial filaments may or may not carry eye-spots. The collar is lobed. The first chaetiger has winged bristles. The remaining thoracic chaetigers carry dorsal bristles with wings of varying breadth and ventral avicular hooks and pickaxe bristles. The abdominal hooks are also avicular and the abdominal bristles winged.

Sabella oatesiana, Benham.

Benham, 1927, p. 135, pl. iv, figs. 116–122.

OCCURRENCE. St. WS 788 (4).

SPECIFIC CHARACTERS. There are no tubes with these specimens. The largest measures 44 mm. by 3 mm. for about 50 chaetigers. The gills are 12 mm. in length. On the gills there are a number of scattered eye-spots varying widely in number and distribution from individual to individual. In one specimen they form two fairly conspicuous irregular bands and in another specimen at the other extreme two or three scattered spots only can be found after careful searching. Minute eye-spots are also present between the rami of the feet in all chaetigers except the first and there are two groups of spots on the pygidium. There are about 20 pairs of gills with slender tips free from barbules. There is a palmar membrane extending for about one-fourth the length of the gills. The pair of long subulate palps extends well beyond the end of the palmar membrane. Dorsally the collar is widely open. It begins with the notopod of the second chaetiger, is slightly incised ventro-laterally and forms a pair of rounded, backwardly curving, ventral lappets. There are eight thoracic chaetigers. The first chaetiger has winged bristles only. In the other thoracic segments there are winged bristles of two types, the one long and the other shorter and with wider wings. The thoracic uncini are avicular with the manubrium prominently rounded in front and curved posteriorly. The main tooth has a crown of numerous denticles. The pickaxe bristles have a long

styliform extremity. In the abdomen the uncini are very similar to those of the thorax and the bristles are also similar to the thoracic, but more slender.

REMARKS. This species is very close to the northern *S. fabricii*, Kröyer.

Genus Potamilla, Malmgren

Branchiae symmetrical, not spiral, without dorsal appendages. The filaments often carry rows of simple or compound eyes. The collar is lobed. The first chaetiger has winged bristles. The dorsal bristles of the remaining thoracic chaetigers consist of winged chaetae and spatulate chaetae. The thoracic tori carry avicular hooks and pick-axe bristles. The abdominal uncini are also avicular and the abdominal bristles are winged.

Potamilla antarctica (Kinberg).

Potamilla antarctica, Gravier, 1907, p. 59, text-figs. 38–43.
Potamilla antarctica (Kinberg), Fauvel, 1916, p. 474, pl. viii, figs. 4–7.
Benham, 1921, p. 109, with synonymy.

OCCURRENCE. St. 190 (numerous); 363 (numerous); 366 (3); 371 (9); 474 (4); WS 231 (1); WS 583 (6); WS 782 (1); WS 785 (4); WS 787 (2); WS 804 (1); WS 805 (1); WS 811 (1); WS 837 (2).

SPECIFIC CHARACTERS. Up to about 230 mm. in length exclusive of the gills. There may be no colour or the gills may have a number of conspicuous bands of reddish brown pigment confined to the barbules and to the inner faces of the filaments. The collar is widely open on the dorsal surface. It slopes upwards and backwards from the front, is entire laterally and forms two ventral lobes separated by a deep incision. The normal number of thoracic chaetigers is eight, but this is subject to variation (*vide* Benham, *loc. cit.*, p. 111). There is no branchial palmar membrane. There is a pair of palps about one-third as long as the gills. They are foliaceous at the base and have long cirriform terminations. There are winged bristles only in the first chaetiger. The remaining thoracic notopods have winged bristles and spatulate bristles, and there are no chaetae transitional between the typical spatulate bristles and the winged bristles. The thoracic tori carry uncini with a crest of denticles and a long base. There are also pickaxe bristles. In the abdomen the uncini have shorter bases than in the thorax. The abdominal bristles are rather more curved and widely winged than the thoracic.

In this species the eggs are incubated inside the branchial plume. The tubes are yellowish, horny and to some extent incrusted with sand grains.

Genus Oridia, Rioja

The members of this genus are small. The branchiae are symmetrical, not spiral and without dorsal processes or eyes. A collar is present. The first chaetiger carries bordered bristles. The dorsal bristles of the remaining thoracic chaetigers have narrow wings and are all of the same type. The thoracic hooks have a long downwardly directed manubrium. There are no pickaxe bristles. The abdominal hooks have a short base and no posterior prolongation. The abdominal bristles are capillary and often geniculate towards the base.

Oridia limbata (Ehlers).

Oria limbata, Ehlers, 1897, p. 137, pl. ix, figs. 211–216.
Fauvel, 1916, p. 476.
Oridia limbata, Benham, 1927, p. 130.

OCCURRENCE. St. 164 (12); WS 564 (9).

SPECIFIC CHARACTERS. Up to about 5 mm. in length. The species is alleged to have otocysts, a pair of cephalic and a pair of pygidial eyes. These are not visible in the present specimens. There are 13 or 14 chaetigers of which eight are thoracic. A collar is present forming a pair of small triangular lappets in the mid-ventral line. Above these lappets is a pair of cirriform processes which I take to be intrabranchial filaments or elongated barbules. There are three pairs of gills. The rachis of each filament has a membrane or border and the barbules cease some distance from the tip. The thoracic bristles are bordered capillaries and the thoracic hooks have a long curved manubrium and about three rows of denticles above the main fang. The abdominal bristles are very slender, unbordered capillaries. The hooks have a short, rounded base and on the face a series of rows of denticles above the basal tooth.

REMARKS. I have not been able to see the bend in the shaft giving the geniculate character to the abdominal bristles, but this may be the fault of the material.

Genus **Chone**, Kröyer

Branchiae symmetrical, not spiral, without eyes or dorsal appendages. A high palmar membrane. Cirriform intrabranchial filaments often present. A well-developed collar. No caudal membrane on the terminal segments. The first chaetiger carries bordered capillary bristles. The bristles of the remaining thoracic chaetigers consist of bordered chaetae and spatulate chaetae. The thoracic hooks have long downwardly directed manubria. There are no pickaxe bristles. The abdominal hooks have short bases without a posterior prolongation, and the abdominal bristles are narrow capillaries.

Chone duneri, Malmgren.

Fauvel, 1927, p. 336, fig. 117 *l–r*.

OCCURRENCE. St. WS 648 (numerous).

SPECIFIC CHARACTERS. These specimens are smaller than the northern representatives of this species, but otherwise I can find no grounds for separation. They measure 12–13 mm. by 1 mm. for about 32 chaetigers, and I take them to be immature. There are eight thoracic chaetigers. The gills end in long filiform tips and there is a palmar membrane for more than half their length. The collar is entire, dorsally oblique and joins on each side of the mid-dorsal line a pair of longitudinal lobes. The dorsal thoracic bristles consist of bordered capillary chaetae and spatulate bristles: the thoracic hooks have long manubria and crests of denticles above the main tooth. The abdominal bristles are long and very slender capillaries with extremely fine borders. The abdominal hooks have a characteristic appearance well shown in Fauvel's fig. *r*. They have a short, square base and a main tooth surmounted by denticles.

REMARKS. I have compared these examples with some specimens from Spitzbergen and except in the matter of size I can find no significant differences. I believe this to be the first record of this species from southern tropical waters.

Genus Euchone, Malmgren

Branchiae symmetrical, not spiral, without eyes or dorsal processes. A high palmar membrane. Cirriform intrabranchial filaments present. A collar is present and otocysts. At the hinder end there is a large anal depression in the form of a ventral gutter or spout. The first chaetiger carries bordered capillary bristles. The bristles of the remaining thoracic chaetigers consist of bordered capillaries and usually also of spatulate or subspatulate chaetae. The thoracic hooks have long downwardly directed manubria. There are no pickaxe bristles. The abdominal hooks have short bases without a posterior prolongation, and the abdominal bristles are narrow capillaries.

Euchone pallida, Ehlers.

Ehlers, 1908, p. 159, pl. xxi, figs. 10–15; pl. xxii, figs. 1–4.
Benham, 1927, p. 139, pl. iv, figs. 126–130.
Monro, 1930, p. 203.

OCCURRENCE. St. 123 (7); 366 (4).

SPECIFIC CHARACTERS. The only complete specimen, from St. 366, is slender for the species and has a body-length of 45 mm. and a gill-length of about 15 mm. It has 32 abdominal chaetigers. The specimens from St. 123 are smaller and have an average body-length of 20 mm. with 22 abdominal chaetigers. They have all lost their gills. In most of the known examples of this species the length of the gills is more than half that of the body. The palmar membrane extends about two-thirds of the distance up the gills. Branchial barbules very long and slender. Tentacular filaments without barbules are present inside the branchial plume.

The collar is open in the mid-dorsal line, at the sides of which it joins a pair of longitudinal fleshy pads below the branchiae. Benham calls these the nuchal gland. The collar is of an equal height all the way round except where it slopes down to join the nuchal gland. It is deeply incised in the mid-ventral line. The thoracic bristles are all narrowly-winged capillaries. There are no spatulate or subspatulate bristles. The thoracic uncini have long downwardly-directed manubria and denticulated heads. There are eight chaetigers in the thorax. The abdominal uncini have a short base with no backward process, about four rows of denticles above the main fang and a pointed boss below it. The abdominal bristles are slender, narrowly-bordered capillaries. The caudal membranes are deep and extend for the last 10–12 segments.

REMARKS. The characteristic feature of this species is the absence of spatulate or subspatulate bristles from the dorsal bundles of the thorax. Augener (1932*a*, p. 70) makes this species a synonym of *Euchone analis*, Kröyer. With this opinion I disagree. Kröyer's species has spatulate or subspatulate bristles in the thoracic notopods, which are wholly absent in the present species.

Family SERPULIDAE

1. Collar bristles bayonet-shaped 2
   Collar bristles simple 3
2. Collar bristles with a pair of large conical processes at base of blade. Operculum shaped like a funnel ... ... *Serpula*
   Collar bristles without large basal processes. Operculum ending in a flat calcareous plate with or without branching spines ... ... *Spirobranchus*
3. Operculum conical with or without spines ... ... *Vermiliopsis*

Genus Serpula, Linnaeus

Operculum funnel-shaped with radii ending in denticulations along the margin. The opercular peduncle is without wings. Collar bristles bayonet-shaped with two large conical teeth at the base of the blade. Thoracic bristles winged, abdominal bristles trumpet-shaped, hooks with few teeth.

Serpula vermicularis, Linnaeus.

Fauvel, 1927, p. 351, fig. 120 *a–q*.
Monro, 1930, p. 206.

Occurrence. St. 27 (4); 160 (1); 190 (2); 366 (numerous); 371 (1); 399 (1); WS 27 (numerous); WS 79 (1); WS 177 (numerous); WS 225 (2); WS 237 (numerous); WS 243 (4); WS 244 (4); WS 246 (3); WS 748 (numerous); WS 766 (2); WS 772 (1); WS 781 (4); WS 782 (2); WS 784 (2); WS 785 (numerous); WS 795 (2); WS 804 (1); WS 811 (6); WS 813 (10); WS 814 (numerous); WS 840 (1); WS 848 (numerous).

Specific characters. Collar bristles with a pair of large conical teeth at the base of the blade. Hooks with four to seven teeth. Tube very variable, cylindrical, rugose, transversely striated, with five to seven longitudinal ridges that may be denticulated. The tube ends in a peristome with a more or less everted lip. In the southern forms the lip of the peristome is more everted than in the northern (var. *narconensis*, Baird).

Genus Vermiliopsis, Saint-Joseph

Collar chaetae variable, usually winged or denticulated. *Apomatus* bristles present in the thorax. Hooks with numerous teeth. Abdominal bristles geniculate. Opercular peduncle without wings. Operculum conical, with or without spines.

Vermiliopsis notialis, Monro.

Monro, 1930, p. 209, fig. 87 *a–e*.

Occurrence. St. WS 33 (2).

Specific characters. Five thoracic chaetigers. Opercular pedicle without wings. Operculum a vesicular body surmounted by a cone covered with chitinous spines except for a triangular area running up its outer face. Collar bristles of two kinds, (1) winged bristles and (2) fine capillary bristles with a denticulated edge. The abdominal bristles are geniculate. The tube has three longitudinal denticulated ridges and a very large peristome.

The present specimens are in poor condition, but I am able partly to supplement my previous account of this species. There appears to be no palmar membrane. There are only five thoracic chaetigers as in *Josephella marenzelleri*. The thoracic membrane is short, arising between the 2nd and 3rd chaetigers and fusing with the collar anteriorly. The collar is high, folded and apparently without incisions. In the mid-ventral line it sends forward a long, pointed tongue. Moreover, again as in *Josephella*, there appears to be an achaetous region between thorax and abdomen almost as long as the thorax itself.

It seems very doubtful whether this species is capable of inclusion within *Vermiliopsis*, but I am unwilling to establish a new genus on material so poor.

Genus Spirobranchus, Blainville

Opercular peduncle winged. Operculum ending in one or more flat calcareous plates with or without a terminal group of branched spines. Collar bristles bayonet-shaped with a finely hirsute edge. Abdominal bristles trumpet-shaped. Hooks with numerous teeth.

Spirobranchus latiscapus (Marenzeller).

Pomatostegus latiscapus, Marenzeller, 1885, p. 218, pl. iv, fig. 5 *a–d*.
Spirobranchus latiscapus, Benham, 1916, p. 158, pl. xlviii, figs. 46–50.
Augener, 1926, p. 272.

Occurrence. St. 941, New Zealand (2).

Specific characters. Of these specimens one measures 23 mm. by 3 mm.: the other is immature and measures 9 mm. by 1 mm. The opercular pedicle is winged. The operculum consists of one to five thin calcareous plates set one above the other in a pile. There are no spines or processes. Sometimes as in the smaller of the present specimens there is only a single plate. Collar chaetae of two kinds, (1) with a short wide striated fin-like process at the base of the narrow anterior blade; (2) simple capillary bristles. The collar is entire ventrally and sends forward a folded extension in the mid-ventral line. It is incised dorso-laterally and forms a pair of small dorsal lobes. These are covered by the very large rounded lobes which are the anterior portion of the thoracic membrane.

The uncini have about a dozen teeth in addition to the basal gouge; they are slightly smaller in the abdomen than in the thorax. The abdominal chaetae are trumpet-shaped.

Remarks. I have with some hesitation followed Benham and Augener in transferring this species from *Pomatostegus* to *Spirobranchus*. In Ehlers's view, the chief distinction between the two genera is the presence in *Pomatostegus* of abdominal sickle or *Salmacina* bristles and in *Spirobranchus* of abdominal trumpet bristles. On this ground the transference is justified, but consistency will then demand the transference of the well-known European *Pomatostegus polytrema* (Philippi), also with trumpet-shaped abdominal chaetae, to *Spirobranchus*. At any rate *polytrema* cannot remain in *Pomatostegus*. In my view the genera in the Serpulids are too narrowly drawn and it will eventually be found

necessary to reconstruct the classification with much wider generic divisions. The present species is very close to if not identical with Pixell's *Spirobranchus maldivensis*. Pixell's species is described as having a slightly higher number of teeth in the uncini—to which little importance is to be attached, especially as an exact count is very difficult to make—and as having an operculum with only a single calcareous plate. The smaller of the present specimens and one of the examples of McIntosh's 'Challenger' *Pomatoceros strigiceps* which Benham rightly identifies with Marenzeller's species, have a single opercular plate and appear to be inseparable from Pixell's *maldivensis*.

INCERTAE SEDIS

Loandalia aberrans, gen. et sp.nov. (Fig. 34 *a–h*).

OCCURRENCE. St. 274, off St Paul de Loanda, Angola. From 8° 40′ 15″ S, 13° 13′ 45″ E to 8° 38′ 15″ S, 13° 13′ 00″ E. 64–65 m. Gear N 4–T. Bottom grey mud. One specimen.

DESCRIPTION. The specimen measures 35 mm. by 1 mm. for 110 chaetigers. The body is more or less cylindrical, somewhat flattened ventrally. The colour in spirit is pale yellow with indefinite brown markings along the sides. The pharynx is almost but not quite fully withdrawn and the exact shape of the head (Fig. 34 *a*) is difficult to determine. It is much broader than long and is squarely cut off in front. There are no eyes, and no tentacles or tentacular cirri. There is a minute pair of palps at the front border of the head. These consist of small cylindrical palpophores surmounted by minute button-like palps (Fig. 34 *b*).

I cannot distinguish the buccal segment from the head. The first foot is represented by a large black broken acicular bristle or hook high up on the sides of the body in the notopodial position. The second chaetiger is represented by a similar large black hook, also broken, accompanied by one or two minute bristles. This hook instead of being notopodial in position is neuropodial and there is no notopod.

The normal neuropods begin at the 3rd chaetiger and consist of cylindrical lobes carrying about half a dozen bristles. They are rather longer in the posterior region than in front. They are supported by an aciculum. For the first five or six chaetigers I can see no notopod. At about the 7th chaetiger the notopods appear in the form of small buttons, each with a large, colourless, transparent acicular chaeta or hook accompanied by two or three very minute bristles (Fig. 34 *c*). These hooks are all broken at the end, and look as if they were partly calcareous and had been attacked by acid. The minute notopodial bristles are nearly all lost. There are no dorsal cirri and the ventral cirri are small, papilliform processes coming out from the lip of the neuropodial chaeta-sac at its most ventral point.

The pharynx is unarmed and there is a thick muscular pharyngeal bulb occupying about the first five chaetigers. At the 54th chaetiger small, cirriform gills begin. They are shorter than the neuropodial lobes and are inserted at the hinder edges of the segments on a level with the neuropods (Fig. 34 *d*). They are continued to the end of the body. As regards the bristles, the notopodium carries a single very large transparent colourless hook and two or three minute bristles (Fig. 34 *e*). The latter are quite smooth,

but under a very high magnification they appear to have a forked or bifid tip (Fig. 34 *f*). With the material at my disposal I cannot be certain of this, for I have been able to examine very few of these bristles and the apparent bifid tips may be the result of fracture or wear. The ventral bristles are simple and strongly denticulated with numerous,

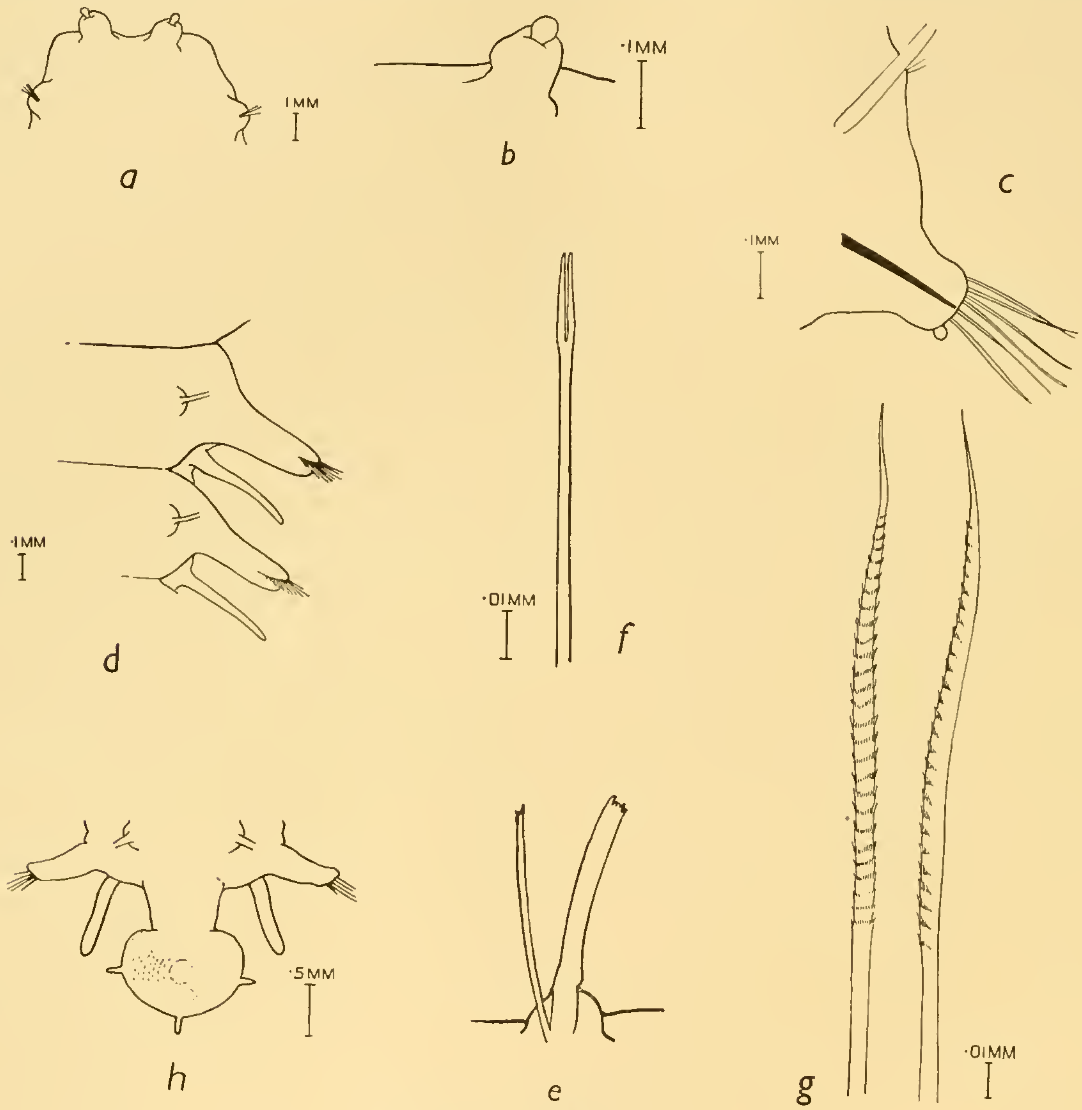

Fig. 34. *Loandalia aberrans.*

a. Head from above.
b. Palp.
c. Middle foot.
d. Feet from branchiate region seen from above.
e. Notopodial bristles. The ends are broken.
f. Smaller notopodial bristle.
g. Ventral bristles.
h. Dorsal view of anal plate.

transverse frills of teeth (Fig. 34 *g*). They are more like certain types of Polynoid bristle than any other.

The body ends in a large, rounded, concave, anal plate (Fig. 34 *h*) carrying on its edge three papillae, a median and two lateral.

REMARKS. I am uncertain as to the systematic position of this form. In the possession of the notopodial acicular bristles and an unarmed pharynx it approaches *Ancistrosyllis*; on the other hand it differs in having no tentacles, tentacular or dorsal cirri. The anal plate recalls to some extent that of *Microphthalmus* to which, however, in other respects it has no resemblance. In the structure of the feet it is closest to the very singular *Telehsapia annandalei*, Fauvel, from which it differs in the possession of a pair of palps and in having no jaws. On the whole I am inclined to regard it as an aberrant Hesionid.

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ECHINOIDEA AND OPHIUROIDEA

By

TH. MORTENSEN

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ECHINOIDEA AND OPHIUROIDEA

By Th. Mortensen

(Plates I–IX; text-figs. 1–53)

INTRODUCTION

THIS report deals with the Echinoids and Ophiurids collected by the 'Discovery', the 'Discovery II' and the 'William Scoresby' in the years 1925–35, mainly in the sub-Antarctic and Antarctic seas, from the Magellanic region to South Georgia, the Palmer Archipelago, the South Sandwich Islands, and off Marion Island. Some few hauls made off Gough Island, Tristan da Cunha, Ascension, South Africa, Angola, Annobon in the Gulf of Guinea, and in Cook Strait, New Zealand, have added a not inconsiderable number of species.

It has been thought preferable in the systematic account to deal with all this material together—not to arrange it according to localities.

Although our knowledge of the Echinoid and Ophiurid fauna of the sub-Antarctic and Antarctic seas is rather extensive, particularly owing to Koehler's divers reports on the collections made by the 'Belgica', the 'Scotia', the 'Pourquoi-Pas?', the Swedish Antarctic Expedition and the Australasian Antarctic Expedition, quite a considerable number of new forms are contained in the Discovery collections, a fact tending to indicate that we are still far from having a complete record of all the species occurring in the sub-Antarctic and Antarctic regions, not to mention the distribution and biology of these forms. But this much we do know, that the sub-Antarctic–Antarctic Echinoderm fauna is exceedingly rich, far exceeding that of the Arctic–sub-Arctic region.

The Discovery collection has afforded me a much desired opportunity of clearing up various little known forms, particularly the Ophiurids from South Georgia described by Studer; also some of those described by Koehler needed revision—not to speak of those described by Jeffrey Bell—a revision which has led to a not inconsiderable reduction in the number of species hitherto recorded from these regions. I beg to express here my great indebtedness to the authorities of the British Museum, London, to Professor Dr W. Arndt of the Berlin Museum, and to Professor Dr Sixten Bock of the Stockholm Museum, Dr E. Leloup of the Bruxelles Museum, and Dr A. Panning of the Hamburg Museum, for lending me type material of various old, insufficiently known forms, thus enabling me to give additional information about them and to supply new illustrations of them, where it was thought desirable.

The Echinoid collection does not contain any large number of species, thirty-one in all (including two varieties), and only three of these, *Notechinus marionis*, *Abatus curvidens* and *Amphipneustes similis*, are new to science.

Twenty-two of these Echinoids are from the Antarctic–sub-Antarctic region. At the same time the species hitherto recorded from the Antarctic region are reduced by one, the *Amphipneustes Mortenseni* of Koehler being shown to be identical with *A. Lorioli*, Koehler, representing only the female sex of the latter species, which was based on a male specimen. No results of more general interest are to be derived from this Echinoid material, the only fact worth special mention being the occurrence of a *Centrostephanus*, probably *C. longispinus* (Phil.), in the Gulf of Guinea, of a *Plagiobrissus*, probably *P. Costae* (Gasco), from off French Congo, and of an *Echinocardium*, probably *E. connectens*, Mortensen, from the Cape Verde Islands, these genera having till now not been recorded from the West African coast.

The Ophiuroid collection contains a considerably larger number of species, viz. 102 species in all (including eight varieties). Of these the following thirty species and varieties are new to science.

Astrochlamys sol, n.sp. (Clarence Island).
Ophioscolex nutrix, n.sp. (South Georgia—Falkland Islands).
O. marionis, n.sp. (Marion Island).
Ophiacantha vivipara, var. *pentactis*, n.var. (Palmer Archipelago).
O. densispina, n.sp. (Falkland Islands).
O. angolensis, var. *inermis*, n.var. (French Congo).
Ophiomitrella falklandica, n.sp. (Falkland Islands—South Shetlands).
Ophiactis seminuda, n.sp. (Tristan da Cunha).
Amphiura grandisquama, var. *guineensis*, n.var. (Gulf of Guinea).
A. microplax, n.sp. (South Georgia).
A. microplax, var. *disjuncta*, n.var. (South Shetlands—South Sandwich Islands).
A. monorima, n.sp. (South Georgia).
A. da Cunhae, n.sp. (Tristan da Cunha).
Amphiodia ascia, n.sp. (Angola).
Amphioplus aciculatus, n.sp. (French Congo).
A. acutus, n.sp. (Palmer Archipelago).
Ophionephthys magellanica, n.sp. (Magellanic Region).
Ophionereis sexradia, n.sp. (Gulf of Guinea).
O. novae-zelandiae, n.sp. (Cook Strait).
Ophiozonella megaloplax, n.sp. (Cook Strait).
O. falklandica, n.sp. (Magellanic Region).
Ophiurolepis brevirima, n.sp. (South Shetlands, Clarence Island).
O. turgida, n.sp. (Magellanic Region).
Homalophiura inornata, var. *tuberosa*, n.var. (South Shetlands).
Ophiura serrata, n.sp. (South Shetlands).
O. flexibilis, var. *crassa*, n.var. (Clarence Island).
Amphiophiura gibbosa, n.sp. (South Shetlands).
Ophiocten bisquamatum, n.sp. (South Georgia).
O. amitinum, var. *simulans*, n.var. (South Africa).
Ophiomusium constrictum, n.sp. (Magellanic Region).

None of the new species represent new generic types; but a new genus, *Ophiolebella*, is established for the *Ophiolebes biscutifer* of G. A. Smith, which does not properly belong to the genus *Ophiolebes*.

To the very rich Ophiurid fauna of the Antarctic and sub-Antarctic seas are thus added no less than sixteen new species and four new varieties. On the other hand the number of Antarctic–sub-Antarctic species of Ophiurids previously recorded is considerably reduced owing to the fact that several of them were found by the present researches to be only synonyms of other species. This holds good of the following species.

Ophiodiplax disjuncta, Koehler, is identical with *Ophiacantha antarctica*, Koehler, from the 'Belgica' (non *Ophiacantha antarctica* (Lyman)), and must henceforth be named *O. disjuncta* (Koehler).

Ophiochondrus falklandica, Koehler, is identical with *O. stelliger*, Lyman.

Amphiura Mortenseni, Koehler, *A. alternans*, Koehler, and *A. Eugeniae*, var. *gracilis*, Hertz, are identical with *A. Belgicae*, Koehler. Very probably also *A. Joubini*, Koehler, is identical with *A. polita*, Koehler (cf. p. 279).

Ophioceramis antarctica, Studer, is identical with *Amphiodia affinis* (Studer).

Amphipholis patagonica, Ljungman, is identical with *A. squamata* (Delle Chiaje).

Ophioperla Ludwigi, Koehler, is identical with *Ophiura Koehleri*, Bell, and must henceforth be named *Ophioperla Koehleri* (Bell).

Ophiozona inermis, Bell, and *Ophioglypha resistens*, Koehler, are identical with *O. Martensi*, Studer, the species having to be named *Ophiurolepis Martensi* (Studer).

Ophiomastus rotundus, G. A. Smith, is identical with *Ophiura meridionalis* (Lyman).

Ophiosteira echinulata, Koehler, is identical with *O. antarctica*, Bell.

Further, the West African *Ophiostigma africanum*, Lyman, is identical with the West Indian *O. abnorme* (Lyman).

In regard to the zoogeography of the Antarctic and sub-Antarctic regions the Ophiurid collection of the 'Discovery' does not materially change our conceptions, as set forth in detail by Koehler (1912) in his report on the Echinoderms of the 'Pourquoi-Pas?', by Ekman (1925) in his report on the Holothurians of the Swedish Antarctic Expedition, and by the present author in his reports on the Echinoids of the German South Polar and the Swedish Antarctic Expeditions. (I may also recall the zoogeographical chapters in A. H. Clark's report on the Crinoids and M. Hertz' report on the Ophiurids of the German South Polar Expedition.) I do not think it desirable or profitable, therefore, to enter again here on a discussion of the zoogeography of the Antarctic and sub-Antarctic regions. Extensive researches in the vast, almost unknown area of the Antarctic to the south of the Pacific Ocean would make a renewed discussion of the zoogeographic problems of the Antarctic region profitable—but such researches are still only a desideratum, as are also more extensive investigations of the bottom fauna of the Antarctic deep sea.

Of considerable zoogeographical interest are the facts of the occurrence of the South African *Amphiura incana* in the Gulf of Guinea and of the North Atlantic *A. Chiajei* as far south as Angola, facts which tend to show that extensive investigations along the west coast of tropical Africa would bring results of very great zoogeographical interest. This is another great desideratum.

As a fact of morphological interest may be mentioned the coalescing above the arm of the two bursae at each radius in *Ophiacantha densispina*, a feature previously known only in *Ophiomitrella corynephora*, H. L. Clark (cf. my Echinoderms of South Africa, p. 332). That the spicules in the bursal wall of this same species of *Ophiacantha* form inner thorns proceeding into the body cavity is a unique feature; but, of course, this has more the value of a curiosity. Another interesting fact is the existence of only a single genital slit in each interradius in *Amphiura monorima* (cf. p. 274).

Much more interest, however, attaches to the discovery that a very great proportion of the Antarctic Ophiurids are viviparous. Till now only six of these Ophiurids were known to be viviparous, viz. *Ophiomyxa vivipara*, *Ophiacantha vivipara*, *O. imago*, *Amphiura magellanica*, *Amphipholis squamata* (*patagonica*) and *Ophionotus hexactis*. I have found no less than twenty-five more of the Antarctic Ophiurids to be likewise viviparous, namely:

Astrochlamys bruneus
Ophioscolex nutrix
O. marionis
Ophiacantha densispina
Ophiomitrella ingrata
O. falklandica
Ophiochondrus stelliger
Amphiura angularis protecta
A. microplax
A. monorima
A. Lymani
A. deficiens
A. Belgicae
Amphiura Eugeniae
Amphiodia affinis
Ophiolebella biscutifera
Ophioceres incipiens
Ophiozonella falklandica
Ophiomages cristatus
Ophiosteira antarctica
Ophiurolepis Martensi
Ophiura meridionalis
O. Rouchi
Amphiophiura Rowetti
A. gibbosa

We thus know now at least thirty-one Ophiurids of the Antarctic and sub-Antarctic regions to be viviparous. Of the other Ophiurids from this region the following twenty-five species are not viviparous:

Gorgonocephalus chilensis
Astrotoma Agassizii
Ophiacantha disjuncta
O. antarctica
Ophiactis asperula
Amphiura angularis
A. microplax disjuncta
A. dilatata Gaussi
A. Joubini
A. princeps
Amphioplus acutus
A. peregrinator
Ophiogona Döderleini
Ophioperla Koehleri
Ophionotus victoriae
Ophiosteira Senouqui
Ophiuroglypha Lymani
Ophiurolepis carinata
O. gelida
O. brevirima
O. Wallini
O. partita
Homalophiura inornata
H. inornata tuberosa
Ophiocten amitinum

The rest of the species are unknown in regard to their sexual character, or the material examined has been insufficient for giving definite information. But it may be regarded as an established fact already that *about* 50 *per cent of the Ophiurids of the Antarctic–*

sub-Antarctic region are viviparous, a perfectly astonishingly high percentage in comparison with other regions, where only very few species are viviparous. Foremost comes here the New Zealand region with six viviparous species out of a total number of forty-one species, thus *ca.* 15 per cent, all other regions having a still smaller number of viviparous forms. Particularly the difference between the Arctic–sub-Arctic and the Antarctic–sub-Antarctic region in regard to the number of viviparous forms is very striking; but this has been repeatedly emphasized, so I shall not go into details here.

I may here mention a statement in literature which would seem to show that the Korean seas are remarkably rich in viviparous Ophiurids. Duncan in his paper *On some Ophiuroidea from the Korean Seas* (Journ. Linn. Soc. Zool., XIV, 1878, p. 464) says about *Ophionereis dubia*, var. *sinensis*, Dunc., that "it has a marsupium, and doubtless, as was commonly the case in these Korean seas, it was viviparous". During a visit to the British Museum in July 1935 I took the opportunity of re-examining all these supposed viviparous Ophiurids from the Korean seas and was able to ascertain that—as I expected—it is all a mistake. The *Ophionereis* happened to be preserved (dried) in such a contracted state that one of its bursae is widely open, looking indeed like a kind of marsupium. But it is only an empty bursa, and there is not the slightest sign that this or any other of Duncan's Ophiurids is viviparous. At the time Duncan wrote this paper the anatomy of the Ophiurids was still very imperfectly known. Not until Ludwig, in this same year, 1878, published his famous paper *Beiträge zur Anatomie der Ophiuren* (Zeitschr. wiss. Zool., XXXI) did we get a real understanding of the bursae of Ophiurids and their relation to the gonads. It was thus quite natural for Duncan to take the widely open bursa of his *Ophionereis* for a marsupium; and seeing the bursal slits also in his other Ophiurids, he naturally concluded that they all were viviparous. But he did not open any of them to ascertain whether there were really young ones within these supposed "marsupia", and did not think either of looking at other Ophiurids, or he would have concluded that they were all brood-protecting, or else have discovered his mistake. Thus we need no longer concern ourselves with these mysterious viviparous Ophiurids of the Korean seas.

In my paper *Biological observations on Ophiurids* (Papers from Dr Mortensen's Pacific Exped., LXIII, Vid. Medd. Dansk Naturh. Foren., 93, 1933) I gave a revised list of all known viviparous Ophiurids, amounting to thirty-two. As *Amphipholis patagonica*, and also *A. japonica* and *sobrina*, are there reckoned as distinct species, whereas in reality they are probably all indistinguishable from *A. squamata*, the actual number of viviparous Ophiurids known up to 1933 was only twenty-nine species. The discovery of no less than twenty-five new viviparous Ophiurids, as stated in the present report, makes it desirable to revise the whole matter again, particularly with regard to the question of the hermaphroditism of the viviparous Ophiurids.

The Ophiurids till now known to be viviparous are:

1. *Astrochlamys bruneus*, Koehler. Sexes separate.
2. *Ophiomyxa vivipara*, Studer. Sexes separate.
3. *O. brevirima*, H. L. Clark. Sexes separate.

4. *Ophioscolex nutrix*, Mortensen. Facultative hermaphrodite.
5. *O. marionis*, Mortensen. Hermaphrodite.
6. *Ophiacantha imago*, Lyman. Sexes separate.
7. *O. marsupialis*, Lyman. Sexual character unknown.
8. *O. vivipara*, Ljungman. Protandric hermaphrodite, or parthenogenetic (?).
9. *O. anomala*, G. O. Sars. Hermaphrodite.
10. *O. densispina*, Mortensen. Sexes separate.
11. *Ophiomitrella clavigera*, Mortensen. Protandric hermaphrodite.
12. *O. corynephora*, H. L. Clark. Protandric hermaphrodite.
13. *O. hamata*, Mortensen. Protandric hermaphrodite.
14. *O. ingrata*, Koehler. Protandric hermaphrodite.
15. *O. falklandica*, Mortensen. Protandric hermaphrodite.
16. *Ophiochondrus stelliger*, Lyman. Hermaphrodite.
17. *Amphiura magellanica*, Ljungman. Hermaphrodite.
18. *A. capensis*, Ljungman. Hermaphrodite.
19. *A. constricta*, Lyman. Hermaphrodite.
20. *A. borealis* (G. O. Sars). Protandric hermaphrodite.
21. *A. Stimpsoni*, Lütken. Hermaphrodite.
22. *A. annulifera*, Mortensen. Hermaphrodite.
23. *A. Stepanovii*, Tscherniawsky. Protandric hermaphrodite.
24. *A. iris*, Lyman. Sexual character unknown.
25. *A. angularis protecta*, Hertz. Hermaphrodite.
26. *A. microplax*, Mortensen. Parthenogenetic (?).
27. *A. monorima*, Mortensen. Hermaphrodite.
28. *A. Lymani*, Studer. Sexes separate.
29. *A. deficiens*, Koehler. Sexual character unknown.
30. *A. Belgicae*, Koehler. Hermaphrodite.
31. *A. Eugeniae*, Ljungman. Parthenogenetic (?).
32. *Amphiodia affinis* (Studer). Hermaphrodite.
33. *Amphipholis squamata* (D. Ch.). Hermaphrodite (including *A. japonica*, *sobrina*, and *patagonica*).
34. *A. misera*, Koehler. Hermaphrodite.
35. *Ophionereis vivipara*, Mortensen. Hermaphrodite.
36. *Cryptopelta aster* (Lyman). Hermaphrodite.
37. *C. granulifera*, H. L. Clark. Hermaphrodite.
38. *Pectinura cylindrica* (Hutton). Hermaphrodite.
39. *P. gracilis*, Mortensen. Hermaphrodite.
40. *Ophioconis vivipara*, Mortensen. Sexual character unknown.
41. *Ophiotjalfa vivipara*, Mortensen. Sexual character unknown.
42. *Ophiolebella biscutifera* (G. A. Smith). Hermaphrodite.
43. *Ophioceres incipiens*, Koehler. Protandric hermaphrodite.
44. *Ophiozonella falklandica*, Mortensen. Sexes separate.
45. *Ophiomages cristatus*, Koehler. Sexual character unknown.
46. *Ophiosteira antarctica*, Bell. Hermaphrodite.
47. *Ophiurolepis Martensi* (Studer). Sexes separate.
48. *Ophiura meridionalis* (Lyman). Hermaphrodite.
49. *O. Rouchi* (Koehler). Sexes separate.
50. *Amphiophiura Rowetti*, G. A. Smith. Hermaphrodite.
51. *A. gibbosa*, Mortensen. Sexual character unknown.
52. *Stegophiura nodosa* (Lütken). Hermaphrodite.
53. *S. vivipara*, Matsumoto. Hermaphrodite.
54. *Ophionotus hexactis* (E. A. Smith). Hermaphrodite.

Omitting the seven species the sexual character of which is unknown, we find thus that nine species of viviparous Ophiurids have separate sexes. Two or three appear to be parthenogenetic, and thirty-six species are hermaphrodites, one of them, *Ophioscolex nutrix*, a facultative hermaphrodite, some specimens having separate sexes.

The overwhelming majority of the viviparous Ophiurids thus are hermaphrodites. Since not a single non-viviparous Ophiurid is known to be hermaphrodite, there must be some connection between viviparity and hermaphroditism. One might suggest the reason for the hermaphroditism of the viviparous forms to be to facilitate fertilization; but the fact that several of these species are protandric hermaphrodites and others apparently parthenogenetic rather tells against such a suggestion. The fact that the species with separate sexes are mainly found among the more primitive forms, *Ophiomyxa*, *Ophiacantha*, may indicate that hermaphroditism represents a condition acquired by the more specialized forms; but since there are also forms with separate sexes among the morphologically highest types, e.g. *Ophiozonella* and *Ophiurolepis*, this reasoning loses its weight. Indeed, the whole matter seems inexplicable from the facts at present available.

Ophioceres incipiens is a rather intricate case. It seems fairly certain that it starts as a male, changing then to female, returning again to the male condition and finally to a pure female condition.

The very interesting fact that a sort of copulation takes place in the viviparous *Astrochlamys bruneus* might also represent an effort to facilitate fertilization; but the three other Ophiurids in which a similar copulation takes place, *Ophiodaphne materna*, Koehler, *Ophiosphaera insignis*, Brock, and *Amphilycus androphorus*, Mortensen, are not viviparous (cf. my paper quoted above, *Biological observations on Ophiurids*, pp. 178–88), so the above suggestion does not apply equally to all four cases of copulation.

It appears that there is a tendency towards an intra-ovarial development in the viviparous Antarctic Ophiurids. The only case hitherto known was *Ophionotus hexactis*; I have now found it to occur likewise in *Amphiura microplax* and *monorima*, and almost certainly also in *A. Lymani* and *Belgicae*, *Ophiomages cristatus*, and *Amphiophiura Rowetti*. The most remarkable of these cases is that of *Ophionotus hexactis*, in which the embryos even pass through a stage as a sort of "pelagic" larva within the ovary (cf. my *Studies of the development and larval forms of Echinoderms*, 1921, p. 179, pl. xxxii).

I cannot suggest any reasonable explanation of this tendency to give up using the bursae as a marsupium and to let the embryos develop within the ovaries themselves. It would seem that fertilization must be less easily practicable within the ovaries than within the bursae. On the whole, there are a number of perplexing questions in connection with this matter: why should there be such a high percentage of viviparous forms in the Antarctic–sub-Antarctic region, when in the Arctic–sub-Arctic region, with corresponding low temperatures, there are relatively much fewer viviparous forms; why that pronounced tendency to hermaphroditism among the viviparous forms, and why the tendency to intra-ovarial development? Perhaps the study of other animal groups in the same region may lead to the solution of these problems.

Mention may here be made of the curious fact discovered in *Ophiomitrella falklandica* that the older young ones within the bursae may feed upon their younger brothers and sisters. This recalls what was found in the viviparous Comatulid *Isometra vivipara*, Mortensen, where the young Pentacrinoids, attached to the cirri of the mother, catch and devour their brother and sister larvae on their passage from the marsupium in the pinnulae, where they are hatched, to the cirri, where they are to attach themselves (cf. my Report on the Crinoidea of the Swedish South Polar Expedition, 1918, p. 15).

One cannot help wondering how the young ones, which in several species reach a very considerable size within the mother, can get out through the genital slits, as for instance in *Ophiolebella biscutifera*, where the young reach the size of 2 mm. in diameter of disk and the genital slits are only 0·5 mm. long. It is astonishing how these young specimens, in spite of their rigid and apparently inflexible skeletons, can assume the most irregular shapes without even the most delicate of their plates being crushed when pressed together in the bursae, and still assume a normal radiate form when they are born. One must marvel also how the mother specimen can get food absorbed, when its stomach is squeezed by the large young ones, or even reduced to a network among the young ones, as in *Ophiochondrus stelliger* (cf. p. 260).

A good many of the Antarctic Ophiurans were found to be infested with parasites, mainly Crustaceans. The ectoparasitic Copepod *Cancerillopsis* was found on several specimens of *Ophiacantha disjuncta*. The curious entoparasitic Copepod *Ophioika* (or something related to it) was found in *Ophiacantha vivipara*, *O. disjuncta*, *Ophiomitrella falklandica*, *Ophiura meridionalis*, and *Ophiurolepis partita*. The Cirripedian *Ascothorax* was found in *Amphiura Belgicae* and *A. microplax*. In *A. Belgicae* likewise a curious sac-shaped, shell-less Gastropod was found, containing a number of embryos with shells (Fig. 19, p. 282). In *A. microplax disjuncta* a Nematode was found coiled up in the male gonads, and in *Ophiochondrus stelliger* a parasitic organism, probably referable to the peculiar problematic *Nidrosia*, which I described from the gonads of *Ophiura Sarsi* (Ingolf Ophiuroids, p. 74). Finally I may mention that I found some specimens of *Ophiacantha rosea* in the British Museum infested with *Myzostoma*, mainly at and within the bursae.

Several of the Ophiurids were taken in considerable numbers by the expedition and must play an important part in the ecology of the Antarctic and sub-Antarctic seas; but by far the most numerous of them is *Ophiocten amitinum*, young specimens of which were taken in several places off the Falkland Islands in incredible numbers, by hundreds of thousands, if not by millions! That they must form an important source of food for other animals is evident, as also that they must be competitors for food, being in both ways a factor of no small importance in the economy of these seas.

ECHINOIDEA

Family CIDARIDAE

Ctenocidaris speciosa, Mortensen

(Plate I, figs. 2–12)

Ctenocidaris speciosa, Mortensen, 1910. Swedish South Polar Exped. Echinoidea, VI, 4, p. 4, pls. i, ii; iii, figs. 1–2; iv, figs. 1–3; xiii.

C. speciosa, H. L. Clark, 1925. Cat. Recent Sea-Urchins Brit. Mus., p. 36.

C. speciosa, Mortensen, 1928. Monogr. Echinoidea. I, Cidaridae, p. 122.

St. 27.[1] 15. iii. 26. West Cumberland Bay, South Georgia, 110 m. Some young specimens, infested with *Echinophyces mirabilis*, Mortensen.

St. 39. 15. iii. 26. East Cumberland Bay, South Georgia, 179–235 m. 1 specimen.

St. 42. 1. iv. 26. Off mouth of Cumberland Bay, South Georgia, 120–204 m. Several specimens, some of them very young; partly infested with *Echinophyces*.

St. 123. 15. xii. 26. Off mouth of Cumberland Bay, South Georgia, 230–250 m. 5 specimens, 3 of them infested with *Echinophyces*. Also 4 very young specimens, just liberated from the marsupium.

St. 140. 23. xii. 26. Stromness Harbour to Larsen Point, South Georgia, 122–136 m. 3 small specimens, infested with *Echinophyces*. Also some very young specimens.

St. 142. 30. xii. 26. East Cumberland Bay, South Georgia, 88–273 m. 1 specimen.

St. 144. 5. i. 27. Off mouth of Stromness Harbour, South Georgia, 155–178 m. 3 specimens.

St. 148. 9. i. 27. Off Cape Saunders, South Georgia, 132–148 m. 6 specimens.

St. 160. 7. ii. 27. Near Shag Rocks, South Georgia, 177 m. 1 large, fine specimen and some small ones.

St. 170. 23. ii. 27. Off Cape Bowles, Clarence Island, 61° 25′ S, 53° 46′ W, 342 m. 1 specimen.

St. 190. 24. iii. 27. Bismarck Strait, Palmer Archipelago, 64° 56′ S, 65° 35′ W, 308–315 m. 6 specimens.

St. 600. 17. i. 31. 67° 09′ S, 69° 27′ W, off Adelaide Island, 487–512 m. 1 damaged specimen: identification not quite certain.

St. WS 33. 21. xii. 26. 54° 59′ S, 35° 24′ W, 135 m. 2 specimens.

St. WS 42. 7. i. 27. 54° 41′ S, 35° 47′ W, 175 m. 2 specimens.

St. MS 71. 9. iii. 27. East Cumberland Bay, South Georgia, 110–60 m. 5 specimens.

This species evidently is quite common off South Georgia and the Shag Rocks, whence the type specimens were brought home by the Swedish South Polar Expedition. As with the original specimens, some of those taken by the Discovery Expedition have the primary spines much overgrown with the slimy colonies of the Bryozoan *Alcyonidium* (Plate I, fig. 5), other specimens having them covered by great numbers of a small white, viviparous bivalve Mollusc (*Limopsis* sp.) (Plate I, figs. 2, 4). Adult specimens with the primary spines clean, not occupied by these commensals, are only rarely found.

A considerable percentage of the smaller specimens are of a quite peculiar appearance. The primary spines are more distinctly thorny and more slender than normal, and

[1] Further data concerning the stations where specimens were taken, including the nature of the bottom, the gear used and the temperature and salinity of the water, will be found in the Station Lists issued in this series of Reports. Particulars of Sts. 1–700 and Sts. WS 1–575 have already been published, and other lists dealing with later stations will appear in due course.

particularly the oral primaries are quite different from those of the normal form, not coarsely serrate as in the latter, but finely thorny like the other primaries and much more slender and fragile than in the typical form. On the whole such specimens look so different from the typical *Ctenocidaris speciosa* that it would seem almost incredible that they could belong to the same species (compare Plate I, figs. 2, 8, 9 with Plate I, figs. 3–5). Nevertheless, they actually do so. Their different appearance is due to the fact that they are infested with the peculiar parasitic organism *Echinophyces mirabilis*, which I described from *Rhynchocidaris triplopora*, Mortensen, in my Report on the Echinoidea of the German South Polar Expedition (1909, pp. 12–17, pl. xii). This parasite, the nature of which is quite problematic (perhaps a Phycomycete), lives in the primary spines (recognizable by some small tubes protruding through the spinules of the spine) and has the extraordinary effect of *causing the genital openings of the host to be removed from their usual place in the apical system to the edge of the peristome*; a new genital duct is formed, leading to the pore at the peristome. It looks, indeed, as if this were a sensible action, with the view of securing the transport of the eggs into the marsupium on the sunken peristome where the embryos are hatched.

In the original material of *Ctenocidaris speciosa* I found a couple of specimens infested with this same parasite; also in these specimens the genital openings were removed from the apical system, not, however, as far as the peristome, but to the middle of the interambulacra. The specimens in the present collection infested with the parasite give some important additional information. In this material also some of the infested specimens have the genital openings in the middle of the interambulacra (Plate I, fig. 11), but others have them at the peristomial edge, a little outside, or at the very edge or below the edge (Plate I, figs. 10, 12). And I find that *the specimens with the genital openings at the peristome are females*, *while those with the openings at the ambitus are males.* (One of the original specimens with the openings at the ambitus was also found to be a male; *op. cit.*, p. 11.)

Apart from this removal of the genital openings from the apical system the parasite has no castrating effect. The infested specimens are breeding fully, and there is not the slightest indication that the embryos are abnormal, though it may well be that the embryos are liable to be infested with the parasite through infection from the mother. I have found both eggs and nearly fully formed young ones in one and the same marsupium, not, however, in many different stages of development but so that the embryos were clearly of two sets, the eggs being thus evidently shed at different intervals, a limited number (scarcely ever more than *ca.* 10) at a time.

As none of the infested specimens exceed *ca.* 30 mm. h.d.[1] (whereas the normal specimens reach a size of at least *ca.* 50 mm. h.d.), it seems beyond doubt that the parasite interferes with the growth and dwarfs the specimens. At the same time they attain sexual ripeness at a much smaller size than the normal specimens. While in the latter the genital openings do not begin to appear until at a size of *ca.* 25 mm. h.d. (they are just about to appear in the specimen shown in Plate I, fig. 6), infested speci-

[1] Horizontal diameter.

mens may already have genital openings at a size of *ca.* 12 mm. h.d. The test may be much more flattened in the parasitized than in the normal specimens. Further, it is a natural consequence of the smaller size of the primary spines that the primary tubercles and their areoles are on the whole conspicuously smaller than in the normal specimens, and while in the latter they are, in the larger specimens, confluent to a considerable extent, they are in the parasitized specimens less confluent, sometimes even conspicuously apart. The median interambulacral space is also, of course, correspondingly more developed than in normal specimens (compare Plate I, fig. 7 with fig. 6). Further, the pedicellariae may afford a curious difference in being invested with a much thicker skin than in normal specimens (cf. Swedish South Polar Exped. Echinoidea, p. 10); this, however, is not a constant feature.

I may recall here the fact that *Ctenocidaris Perrieri*, Koehler, is also liable to attack by the parasite *Echinophyces* (cf. Monogr. Echinoidea. I, Cidaridae, p. 124).

The specimens from Sts. 170 and WS 42 differ from the typical form in having the oral primaries more spade-shaped, without coarse serrations (compare Plate I, figs. 3 and 5). As, however, they do not differ in their other characters from the typical form, and as also specimens intermediate in this regard occur, there is no reason for distinguishing these specimens as a separate variety, still less as a separate species.

In the original description of this species (*op. cit.*, p. 7) it was suggested that it might prove to be brood-protecting. In the material at hand there are, as a matter of fact, some specimens which carry embryos on the peristome—but only among the parasitized specimens; not one of the several normal adults is carrying young ones. Does it mean, perhaps, that only the parasitized specimens are brood-protecting, the normal ones not? This question cannot be answered from the material at hand. In the quite young, normal specimens, *ca.* 3 mm. diameter of test, the primary spines are of a distinctly embryonal character, rather strongly thorny (cf. Swedish South Polar Exped. Echinoidea, pl. xiii, fig. 6), very different from the largest of the embryos found in the marsupium of parasitized specimens; also the youngest free parasitized specimens have their primary spines much less thorny, and in addition their secondary spines differ from those of the normal ones in being coarser.

Ctenocidaris Perrieri, Koehler

Ctenocidaris Perrieri, Koehler, 1912. II^e Expéd. Antarct. Française. Echinodermes, p. 150, pls. xii, figs. 4–8; xiii, figs. 2–8; xiv, figs. 9–14; xv, figs. 1–10.

C. Perrieri, H. L. Clark, 1925. Cat. Recent Sea-Urchins Brit. Mus., p. 35.

C. Perrieri, Mortensen, 1928. Monogr. Echinoidea. I, Cidaridae, p. 123, pl. lxix, fig. 23.

St. 181. 12. iii. 27. Schollaert Channel, Palmer Archipelago (64° 20′ S, 63° 01′ W, 160–335 m.). 4 adult specimens and 1 very young specimen.

None of these specimens carry embryos on their peristome, and there is thus still no proof of the suggestion set forth in my Cidarid Monograph (*op. cit.*, p. 124) that this species may be brood-protecting like *C. speciosa*. All the specimens are normal, not infested with *Echinophyces*.

The single very young specimen is too young (4 mm. h.d.) to be identified with certainty; it might equally well be referred to *C. speciosa*. But as it was found together with the adult *C. Perrieri*, whereas *C. speciosa* was not found at this station, there is the probability that it is *C. Perrieri*.

Ctenocidaris Geliberti (Koehler)

(Plate IX, fig. 8)

Eurocidaris Geliberti, Koehler, 1912. II^e Expéd. Antarct. Française. Echinodermes, p. 146, pl. xiv, figs. 1–8.

E. Geliberti, Koehler, 1926. Austral. Antarct. Exped. Echinod. Echinoidea, p. 22, pls. 102, fig. 8; 119, fig. 3.

Ctenocidaris Geliberti, Mortensen, 1928. Monogr. Echinoidea. I, Cidaridae, p. 126, pl. lxxvii, fig. 9.

St. 599. 17. i. 31. 67° 08′ S, 69° 06′ W, 203 m. 1 specimen.

This is a young specimen, still without a trace of the genital openings, although of a fairly large size, 20 mm. h.d. This indicates that this species grows to a considerable size. The type, and only specimen hitherto known, is 30 mm. h.d.

As in the type specimen one of the oculars is insert. It is Oc. IV, as seems to be the case also in the type; this then may not improbably be a specific character. In the type specimen no large globiferous pedicellariae were found; Koehler even says (*op. cit.*, 1926) that they do not exist in this species. The present specimen shows this to be a mistake, a couple of large globiferous pedicellariae being found on its apical system. The valves (Plate IX, fig. 8) are long and slender, much as in *C. spinosa* (Koehler) (cf. Monogr. Echinoidea. I, Cidaridae, p. 125).

The young developing upper primary spines are greenish. The denuded test is white.

The locality of this specimen is close to that of the type specimen (Baie Marguerite); also the depth is the same.

Austrocidaris canaliculata (A. Agassiz)

(Plate I, fig. 1)

Austrocidaris canaliculata, Mortensen, 1910. Swedish South Polar Exped. Echinoidea, p. 11, pls. iii, figs. 6–8; iv, figs. 4–11; xiv, figs. 1–2, 6–11, 16–18.

A. canaliculata, H. L. Clark, 1925. Cat. Recent Sea-Urchins Brit. Mus., p. 27.

A. canaliculata, Mortensen, 1928. Monogr. Echinoidea. I, Cidaridae, p. 141, pls. xvi, figs. 14–15; lxxvii, fig. 18.

St. 51. 4. v. 26. Off Eddystone Rock, East Falkland Islands, 105–115 m. 2 specimens.

St. WS 81. 19. iii. 27. 8 miles N 11° W of North Island, West Falkland Islands, 81–82 m. Several specimens.

St. WS 82. 21. iii. 27. 54° 06′ S, 57° 46′ W, 140–144 m. 2 specimens.

St. WS 84. 24. iii. 27. 7½ miles S 9° W of Sea Lion Island, East Falkland Islands, 74–75 m. 9 specimens (young).

St. WS 85. 25. iii. 27. 8 miles S 66° E of Lively Island, East Falkland Islands, 79 m. Several specimens.

St. WS 86. 3. iv. 27. 53° 53′ S, 60° 34′ W, 147–151 m. 1 small specimen.
St. WS 88. 6. iv. 27. 54° 00′ S, 64° 57′ W, 118 m. 2 specimens.
St. WS 90. 7. iv. 27. 13 miles N 83° E of Cape Virgins Light, Argentina, 52° 18′ S, 68° 00′ W, 82 m. 1 specimen.
St. WS 91. 8. iv. 27. 52° 53′ S, 64° 37′ W, 191–205 m. 1 specimen.
St. WS 92. 8. iv. 27. 51° 58′ S, 65° 01′ W, 143–145 m. 2 specimens.
St. WS 93. 9. iv. 27. 7 miles S 80° W of Beaver Island, West Falkland Islands, 130–133 m. 2 young specimens.
St. WS 98. 18. iv. 27. 49° 54′ S, 60° 35′ W, 171–173 m. 2 specimens.
St. WS 576. 17. iv. 31. 51° 35′ S, 57° 50′ W, 34–24 m. 5 specimens.
St. WS 755. 21. ix. 31. 51° 39′ S, 57° 39′ W, 75 m. 5 specimens.
St. WS 816. 14. i. 32. 52° 10′ S, 64° 56′ W, 150 m. 3 specimens.
St. WS 818. 17. i. 32. 52° 31′ S, 63° 25′ W, 272–278 m. 3 specimens.
St. WS 823. 19. i. 32. 52° 14′ S, 60° 01′ W, 80–95 m. 1 specimen.
St. WS 824. 19. i. 32. 52° 29′ S, 58° 27′ W, 146–137 m. 2 specimens.
St. WS 825. 19. i. 32. 50° 50′ S, 57° 13′ W, 135–144 m. 3 specimens.
St. WS 837. 3. ii. 32. 52° 49′ S, 66° 28′ W, 98–102 m. Several (young) specimens.
St. WS 847. 9. ii. 32. 50° 16′ S, 67° 57′ W, 51–56 m. 1 specimen.

From St. WS 85 there is a very fine specimen carrying a great number of embryos on the apical system. As a photographic figure of a specimen of this species carrying young ones has never been given, the drawing published by Wyville Thomson (Journ. Linn. Soc. Zool., XIII, 1876, p. 65; The Atlantic, II, p. 224) being the only figure hitherto in existence, I take the opportunity of giving here a photographic figure of the present specimen. It has one of its primary spines covered by a colony of an Ascidian, another by a sponge, while a third carries a thick lump of a Bryozoan, and others carry small *Spirorbis* tubes. The upper primaries are pointing straight upwards, not bent so as to cover the apical system; the young ones are held together in a large mass between these upright spines; apparently they do not use their tube feet for attaching themselves to the spines of the mother.

Eucidaris tribuloides (Lamk.)

(Plate I, figs. 13–15)

Eucidaris tribuloides, Mortensen, 1928. Monogr. Echinoidea. I, Cidaridae, p. 400.

St. 1. 16. xi. 25. Clarence Bay, Ascension Island, 16–27 m. 12 specimens.
St. 283. 14. viii. 27. Off Annobon, Gulf of Guinea, 18–30 m. 15 specimens.

These specimens again raise the question whether the form of *Eucidaris* from Ascension, which was designated by Koehler as *Cidaris minor*, should be regarded as a separate variety of *Eucidaris tribuloides*, or even as a separate species, or simply united with the typical *E. tribuloides*. In my Monograph of the Cidaridae (pp. 405–6) I came to the conclusion that there is no reason to distinguish it even as a variety.

The specimens in hand from Ascension are all very alike in regard to the markedly verticillate primary spines and the brown-banded secondaries. On comparing them with specimens of corresponding sizes from the West Indies it is evident that, besides the much more verticillate character of the primary spines, the Ascension form has in general a conspicuously larger peristome (cf. Plate I, figs. 13 and 15); the apical system

also is slightly larger. Further, there is a very conspicuous difference in the colour of the secondary spines: a uniform yellowish or whitish with scarcely any indication of a darker band in the West Indian form, brownish or with a very conspicuous brownish band in the Ascension form. On the other hand, the young specimens from Annobon, Gulf of Guinea, are much more like the Ascension form, the secondary spines being almost as dark and the primary spines almost as distinctly verticillate as in the latter. Also the dark band on the secondary spines may be rather distinct in the Annobon specimens, and the dimensions of apical system and peristome are likewise rather alike. It therefore seems to follow that the Ascension form is identical with the West African form, viz. the var. *africana* of *E. tribuloides*. But as long as we do not know any large specimens of either the typical *tribuloides* or the variety from Ascension (the largest of the specimens in hand is 17 mm. h.d.), there is always the possibility that the Ascension form does not grow to such a large size as the typical form and the var. *africana*, and if so the Ascension form evidently should be regarded as a distinct variety. For the present the question cannot be definitely settled.

In regard to the pedicellariae, it may be pointed out that the large globiferous ones are like those of the typical West Indian *tribuloides*. No tridentate pedicellariae are found on any of the specimens examined.

Measurements are given here of some of the specimens from Ascension and, for the sake of comparison, of specimens from the West Indies and from Annobon of corresponding sizes; of the latter, unfortunately, only quite young specimens are available.

h.d. mm.	v.d. mm.	Apical system mm.	Peristome mm.	Number of		Longest spines mm.
				I.A.	A. pro I.A.	
		Eucidaris tribuloides from Ascension				
17·2	9	8·5 (49·4 % h.d.)	10 (53 % h.d.)	6	7–8	11
15	8	7 (46·6 „)	8 (53·3 „)	6–7	7–8	14
12·5	7	6 (48 „)	8 (64 „)	6	7	7
11·5	6·5	6 (50·2 „)	7 (60·9 „)	5	7–8	9
11	6	5·5 (50 „)	6·5 (59 „)	5	7–8	8
8	4	4 (50 „)	4·5 (56·2 „)	4–5	5–6	8
		Eucidaris tribuloides, West Indies, typical form				
18	7·5	7 (39 „)	7 (39 „)	6	8–9	20
17	9	7 (41·2 „)	8 (47 „)	6	7–8	17
13	7	6 (46·1 „)	6·5 (50 „)	6	7–8	19
10	5	4·5 (45 „)	5 (50 „)	5–6	6–8	9
		Eucidaris tribuloides, var. *africana* from Annobon				
11	5	5·5 (50 „)	6 (54·5 „)	5	6–7	8
8	4	4 (50 „)	4 (50 „)	4–5	5–6	9

Family ARBACIIDAE

Arbacia Dufresnii (Blainville)

Arbacia Dufresnii, P. de Loriol, 1904. Notes pour servir à l'Étude des Echinodermes, 2 Sér., II, p. 8, pl. ii, figs. 2–5.
A. Dufresnii, Agassiz and H. L. Clark, 1908. Hawaiian Echini. The Salenidae, Arbaciadae, etc., p. 69, pl. 47, figs. 1–11.
A. Dufresnii, Mortensen, 1910. Swedish South Polar Exped. Echinoidea, p. 25, pls. v, figs. 4–12; xv, figs. 2–3, 6, 8–10, 13.
A. Dufresnii, H. L. Clark, 1925. Cat. Recent Sea-Urchins Brit. Mus., p. 69.
A. Dufresnii, Mortensen, 1935. Monogr. Echinoidea. II, p. 579.

St. 1321. 16. iii. 34. Cockburn Channel, Tierra del Fuego, 66 m. 4 specimens and 4 dead tests.
St. WS 71. 23. ii. 27. 6 miles N 60° E of Pembroke Light, East Falkland Islands, 80–82 m. 1 specimen.
St. WS 81. 19. iii. 27. 8 miles N 11° W of North Island, West Falkland Islands, 81–82 m. 3 specimens.
St. WS 83. 24. iii. 27. 14 miles S 64° W of George Island, East Falkland Islands, 129–137 m. 8 specimens.
St. WS 85. 25. iii. 27. 8 miles S 66° E of Lively Island, East Falkland Islands, 79 m. 2 specimens.
St. WS 583. 2. v. 31. 53° 39′ S, 70° 54′ W, 14–78 m. 1 specimen.
St. WS 755. 21. ix. 31. 51° 39′ S, 57° 39′ W, 75 m. 2 specimens.

H. L. Clark (*op. cit.*, 1925) has called attention to the remarkable fact that this species has never been recorded from the Falkland Islands. Upon zoogeographical grounds it was rather inexplicable that it should not occur there, the Falkland Islands being so integral a part of the Magellanic region, where this species otherwise is widely distributed. It extends up to the La Plata River on the east coast and to 42° S on the west coast (Puerto Montt), and also as far south as the Antarctic Coast (Booth Wandel Island, cf. below), its range in depth being from the littoral region down to *ca.* 300 m. It is thus very satisfactory that the species has now been found to occur also off the Falkland Islands.

The species might well be expected to occur also off South Georgia; but as it has never been recorded from there, and as it is not represented in any of the numerous dredgings off South Georgia by the 'Discovery' it would seem to be a fact that it does not occur there. This induces one to think that there must be something wrong with the single specimen from the Antarctic coast (Booth Wandel Island) brought home by the Expédition Charcot (cf. Koehler, 1906, Stellérides, Ophiures et Echinides. Expéd. Antarct. Française, 1903–1905, p. 29). As a misidentification is hardly thinkable, I cannot help suggesting that there must be a mistake with the label, the specimen having in reality been obtained from some South American locality. If the species really occurs on the Antarctic coast, it is strange that the Discovery as well as all the other Antarctic expeditions failed to find it to the south of South America.

In view of Bernard's statement (*Echinides recueillis par l'Expédition du Cap Horn*, Bull. Mus. d'hist. nat. Paris, 1895) that this species is brood-protecting, rearing its young on the buccal membrane, it is important to notice that there is no indication that any of the specimens at hand carry the young ones on the peristome. Moreover, I think

it quite beyond doubt that Bernard's observation rests on a misinterpretation, viz. that the young specimen (of 6 mm. h.d.) which he found on the peristome of one of his specimens had come there accidentally, probably during capture or preservation. The fact that the eggs of *A. Dufresnii* are very small, 0·1 mm., and extremely numerous is entirely incompatible with a brood-protecting habit and indicates that this species has pelagic larvae, as is the case with the other species of *Arbacia*. Studer's observation (*Gazelle-Echinoidea*, Monatsber. Akad. Berlin, 1880, p. 868) that the eggs when shed remained attached to the test, is no doubt due to the unnatural conditions under which the observation was made. In any Echinoid with pelagic larvae the same thing may be observed; ripe specimens on being removed from the water are very often induced to shed their eggs and then the eggs will remain in thick clusters on the test, among the spines, whereas when shed under natural conditions the eggs are gradually dispersed in the water. I have found such thick layers of eggs in preserved specimens of many species of sea-urchins known to have pelagic larvae; and not only the eggs, even the sperm may be found similarly lying in thick layers on the test. Both cases are found among the specimens of *A. Dufresnii* in this collection. It may be added that these eggs —as was to be expected—are found to be unfertilized, or at least cleavage has not yet begun. We may thus certainly dismiss, as without any foundation whatever, the idea that *A. Dufresnii* is a brood-protecting species (cf. Mortensen, Swedish South Polar Exped. Echinoidea, p. 32).

Family DIADEMATIDAE

Diadema antillarum, var. ascensionis, Mortensen

Diadema ascensionis, Mortensen, 1909. Deutsche Südpolar-Exped. Echinoiden, p. 55, Taf. vii, fig. 10; xvi, figs. 1, 4, 8, 16–17, 21–23.

D. antillarum, var. *ascensionis*, Mortensen, 1933. *Echinoderms of St Helena* (*other than Crinoids*). Papers from Dr Th. Mortensen's Pacific Exped., 1914–16, LXVI (Vid. Medd. Dansk Naturh. Foren., 93), p. 465.

For other literary references see my paper of 1933, *loc. cit.*

St. 1. 16. xi. 25. Clarence Bay, Ascension, 16–27 m. 7 specimens.

As set forth in my paper on the Echinoderms of St Helena, the shape of the tridentate pedicellariae is so characteristic and constant that it is not justifiable to identify this mid-Atlantic *Diadema* simply as *D. antillarum*. Whether we regard it as a variety of the latter, or as a separate species, is of small importance.

The specimens all have the spines banded with white and brownish, and are, indeed, very delicate and beautiful objects. Concerning the blue lines (which appear white in the preserved specimens) it may be pointed out that there are two parallel lines in each interambulacrum, not one bifurcating line, as stated in my paper on the St Helena Echinoderms; the two lines issue separately from the apical ring, though apparently not directly connected with the latter.

Centrostephanus sp. (young)

St. 283. 14. vii. 27. Annobon, Gulf of Guinea, 18–30 m. 5 specimens.

These specimens are probably the young of *C. longispinus* (Philippi); but they are too young to be identified with certainty as belonging to this species, the young stages of which are unknown. They are of sizes 4–8 mm. h.d.; no genital pores are formed as yet. The spines are banded, brownish and white.

Family TEMNOPLEURIDAE

Genocidaris maculata, A. Agassiz

Temnocidaris maculata, A. Agassiz, 1872. Revision of the Echini, p. 286, pl. viii, figs. 1–18.
Genocidaris maculata, Mortensen, 1903. Danish 'Ingolf' Exped. Echinoidea, 1, p. 84, pls. vii, figs. 24, 30; viii, fig. 7.
G. maculata, Döderlein, 1906. Deutsche Tiefsee-Exped. Echinoiden, p. 198, Taf. xxv, fig. 2; xxxv, fig. 13; xlvi, fig. 4.
G. maculata, H. L. Clark, 1925. Cat. Recent Sea-Urchins Brit. Mus., p. 76.

St. 279. 10. viii. 27. Off Cape Lopez, French Congo, 58–67 m. 1 specimen.

The specimen is a young one, only 4 mm. h.d., with as yet no genital pores. But I see no reason to doubt that it is really this species which has already been recorded from off the Congo by Döderlein (*op. cit.*).

Family ECHINIDAE

Sterechinus Agassizii, Mortensen

(Plate II, figs. 11–16)

Sterechinus Agassizii, Mortensen, 1910. Swedish South Polar Exped. Echinoidea, p. 42, pls. vi, figs. 9–12; vii, fig. 3; xvi, figs. 1, 7–8, 13, 15, 18.
Echinus margaritaceus, H. L. Clark, 1912. Hawaiian Echini. Pedinidae...Echinometridae, p. 262.
E. diadema, H. L. Clark, 1925. Cat. Recent Sea-Urchins Brit. Mus., p. 113.

For references to literature prior to 1910 I may refer to my work on the Echinoids of the Swedish South Polar Expedition, *loc. cit.*

St. 27. 15. iii. 26. West Cumberland Bay, South Georgia, 110 m. 2 specimens.
St. 39. 25. iii. 26. East Cumberland Bay, South Georgia, 179–235 m. 7 specimens.
St. 42. 1. iv. 26. Off mouth of Cumberland Bay, South Georgia, 120–204 m. 2 specimens (young).
St. 146. 8. i. 27. 53° 48′ S, 35° 37′ W, South Georgia, 728 m. Several specimens.
St. 157. 20. i. 27. 53° 51′ S, 36° 11′ W, South Georgia, 970 m. 4 specimens.
St. 158. 21. i. 27. 53° 48′ S, 35° 57′ W, South Georgia, 401–411 m. 16 specimens.
St. 160. 7. ii. 27. Near Shag Rocks, South Georgia, 177 mm. 8 specimens.
St. WS 27. 19. xii. 26. 53° 55′ S, 38° 01′ W, South Georgia, 107 m. 5 specimens.
St. WS 86. 3. iv. 27. 53° 53′ S, 60° 34′ W, South Georgia, 151–147 m. 5 specimens.
St. WS 91. 8. iv. 27. 52° 53′ S, 64° 37′ W, South Georgia, 191–205 m. 1 specimen.
St. WS 93. 9. iv. 27. 7 miles S 80° W off Beaver Island, West Falkland Islands, 133 m. 4 specimens (young).
St. WS 97. 18. iv. 27. 49° 00′ S, 61° 58′ W, 146 m. 1 specimen.

St. WS 99. 19. iv. 27. 49° 42′ S, 59° 14′ W, 251–225 m. 2 specimens.
St. WS 109. 26. iv. 27. 50° 18′ S, 58° 28′ W, 145 m. 3 specimens.
St. WS 211. 29. v. 28. 50° 17′ S, 60° 06′ W, 161–174 m. 2 specimens.
St. WS 228. 30. vi. 28. 50° 50′ S, 56° 58′ W, 229–236 m. 1 specimen.
St. WS 246. 19. vii. 28. 52° 25′ S, 61° 00′ W, 267–208 m. 1 specimen.
St. WS 248. 20. vii. 28. 52° 40′ S, 58° 30′ W, 210–242 m. 12 specimens.
St. WS 795. 18. xii. 31. 46° 14′ S, 60° 24′ W, 157–161 m. 1 specimen.
St. WS 840. 6. ii. 32. 53° 52′ S, 61° 49′ W, 368–463 m. 1 specimen.
St. MS 71. 9. iii. 26. East Cumberland Bay, South Georgia, 110–160 m. 1 specimen.

The specimens from St. 39 might almost equally well be identified as *S. antarcticus* (cf. below).

The specimen from St. WS 91 measures no less than 81 mm. h.d., and thus by far exceeds the largest size hitherto recorded for this species, viz. 60 mm. It is of the typical shape, low-conical (Plate II, figs. 14–16); even at this large size the oculars are all exsert. As might be expected, the secondary tubercles of the oral side are particularly well developed; but the fact that the areoles of the consecutive plates are widely separated is unusual, they being otherwise as a rule confluent. On the other hand, the areoles of the primary and the larger secondary tubercles of the same plates may be confluent near the ambitus. That this is merely an individual peculiarity, not indicating a local type, appears from the fact that other specimens from the same region (e.g. St. WS 109) have the areoles confluent.

Plate II, figs. 12, 13 give a good representation of the characteristic appearance of this species when preserved with its dense, bristling coat of delicate secondary spines intact. Unfortunately these spines, as well as the primary ones, are exceedingly brittle so that the merest touch will break them.

Sterechinus antarcticus, Koehler

Sterechinus antarcticus, Koehler, 1902. Result. Voyage 'Belgica'. Echinides et Ophiures, p. 8, pls. ii, figs. 9–10; iii, figs. 1–8, viii, figs. 55–56.

S. antarcticus, Mortensen, 1909. Deutsche Südpolar-Exped. Echinoiden, p. 75, Taf. viii, figs. 2, 4, 14–15; ix, figs. 1, 3–5, 14; xvii, figs. 1, 7, 10, 16, 19–21, 26, 30.

St. 170. 23. ii. 27. Clarence Island, 342 m. 4 specimens.
St. 175. 2. iii. 27. Bransfield Strait, South Shetlands, 200 m. 1 specimen (young).
St. 177. 5. iii. 27. 27 miles SW of Deception Island, South Shetlands, 1080 m. 1 specimen (fragments).
St. 180. 11. iii. 27. Schollaert Channel, Palmer Archipelago, 160–330 m. 2 specimens.
St. 181. 12. iii. 27. Schollaert Channel, Palmer Archipelago, 160–335 m. 3 specimens.
St. 182. 14. iii. 27. Schollaert Channel, Palmer Archipelago, 278–500 m. 1 specimen.
St. 599. 17. i. 31. 67° 08′ S, 69° 06′ W, 203 m. 1 specimen (young).
St. WS 167. 1. iii. 28. 53° 31′ S, 39° 22′ W, 460 m. 1 specimen.

The distinction between *S. antarcticus* and *S. Agassizii* is not sharp; as a matter of fact the specimens from St. 181 may perhaps rather be referable to *S. Agassizii*, while, on the other hand, the specimens from St. 39 mentioned above under *S. Agassizii* might equally well be referred to *S. antarcticus*. The consequence is that *S. antarcticus* can hardly be maintained as a separate species, but only as a variety, and not even a very

distinct variety. The reason why I do not follow H. L. Clark (Hawaiian Echini, Pedinidae...Echinometridae, p. 262; Cat. Recent Sea-Urchins Brit. Mus., p. 113) in regarding *antarcticus* as a simple synonym of *S. diadema* (Studer)—with which latter also *S. Agassizii* and *Neumayeri* are united as simple synonyms—is because the typical *antarcticus* is a very characteristic form and apparently mainly confined to the Antarctic, whereas both *diadema* and *Agassizii* are mainly sub-Antarctic. That *antarcticus* and *Agassizii* meet off South America, the former extending as far north as South Shetlands, perhaps South Georgia, the latter as far south as South Georgia, the two forms thus meeting there, is a natural consequence of the geography of this region. Very probably the two forms also interbreed here, this adding to the difficulty of distinguishing them clearly in all cases. If they did occur together over their whole area, I should not hesitate to regard them as only one very variable species; but so far as at present known each of them has its own area of distribution. Therefore I do not think it correct simply to regard them all as one single species, as does Clark. That *diadema*, *Agassizii* (formerly "*margaritaceus*") and *antarcticus* are very closely related and evidently only local specializations of one single, original species I quite agree. As for *S. neumayeri* I do not think it so closely connected with the other three forms, but quite a distinct species, though it also evidently interbreeds with *antarcticus* (or *Agassizii*), which makes some specimens, very probably hybrids, difficult to refer with certainty to one or other form.

Sterechinus Neumayeri (Meissner)

(Plate II, figs. 1–4)

Sterechinus Neumayeri, Mortensen, 1909. Deutsche Südpolar-Exped. Echinoiden, p. 64, Taf. vii, fig. 7; viii, fig. 6; ix, figs. 2, 6–7, 9, 11–13, 15; xvii, figs. 2–6, 8, 12–14, 17–18, 22–23, 27, 29.

S. Neumayeri, Mortensen, 1910. Swedish South Polar Exped. Echinoidea, p. 42, pls. vi, figs. 7–8; vii, figs. 1–2, 4.

S. Neumayeri, Koehler, 1912. IIe Expéd. Antarct. Française. Echinodermes, p. 160, pl. xiii, fig. 1.

For other literary references see the work of 1909, *loc. cit.*

St. 141. 29. xii. 26. East Cumberland Bay, South Georgia, 17–27 m. 1 specimen.

St. 163. 17. ii. 27. Paul Harbour, Signy Island, South Orkneys, 18–27 m. 16 specimens.

St. 164. 18. ii. 27. Normanna Strait, Coronation Island, South Orkneys, 24–36 m. Several specimens.

St. 173. 28. ii. 27. Port Foster, Deception Island, South Shetlands, 5–60 m. Several specimens.

St. 371. 14. iii. 30. 1 mile E of Montagu Island, South Sandwich Islands, 99–61 m. 1 specimen.

St. 1489. 17. i. 35. Port Lockroy, Wiencke Island, Palmer Archipelago. On the beach, at low tide. 1 specimen.

St. MS 71. 5. iii. 26. East Cumberland Bay, South Georgia, 110–60 m. 2 specimens.

St. MS 73. (No information.) South Georgia. 3 specimens.

St. MS 74. 17. iii. 26. East Cumberland Bay, South Georgia, 22–40 m. 2 specimens.

The specimens from St. MS 71 are unusually lightly coloured and have a rather close resemblance to *S. Agassizii*; quite probably they are hybrids between these two species.

The specimens from St. 173 have unusually long primary spines, thus looking rather different from the normal form (Plate II, figs. 1–3). There are, however, no other differences, and as other specimens are rather intermediate in regard to the length of the spines, I do not think it desirable to designate these specimens by a separate name, not even as a "forma".

Notechinus magellanicus (Philippi)

Notechinus magellanicus, Döderlein, 1906. Deutsche Tiefsee-Exped. Echinoiden, p. 227, Taf. xxvii, fig. 9; xxviii, figs. 3–4; xxxv, fig. 15; xlvii, fig. 5.

N. magellanicus, Mortensen, 1910. Swedish South Polar Exped. Echinoidea, p. 36, pl. xvi, figs. 3, 6, 9–12, 19.

N. magellanicus, Bernasconi, 1925. Result. Primera Exped. a Tierra del Fuego. Equinodermos, p. 10, Lam. ii, figs. 1–3.

Pseudechinus magellanicus, H. L. Clark, 1925. Cat. Recent Sea-Urchins Brit. Mus., p. 118.

St. 48. 3. v. 26. 8·3 miles N 53° E of Port William, Falkland Islands, 105–115 m. Several specimens.

St. 51. 4. v. 26. Off Eddystone Rock, East Falkland Islands, 105–115 m. 3 specimens.

St. 52. 5. v. 26. Port William, East Falkland Islands, 17 m. 1 specimen.

St. 229. 4. v. 27. 53° 40′ S, 61° 10′ W, 46–0 m. 3 specimens.

St. 388. 16. iv. 30. 56° 19′ S, 67° 10′ W, 121 m. 11 specimens.

St. 652. 14. iii. 31. 54° 04′ S, 61° 40′ W, Burdwood Bank, 171–169 m. 1 specimen.

St. 724. 16. xi. 31. Fortescue Bay, Magellan Strait, 0–5 m. 5 specimens.

St. WS 71. 23. ii. 27. 6 miles N 60° E of Cape Pembroke, East Falkland Islands, 82–80 m. Several specimens.

St. WS 73. 6. iii. 27. 51° 01′ S, 58° 54′ W, 121–130 m. Several specimens.

St. WS 77. 12. iii. 27. 51° 01′ S, 66° 31′ W, 110–113 m. Several specimens.

St. WS 79. 13. iii. 27. 51° 01′ S, 64° 59′ W, 132–131 m. 1 specimen.

St. WS 80. 14. iii. 27. 50° 57′ S, 63° 37′ W, 152–156 m. 6 specimens, and 5 dead tests.

St. WS 81. 19. iii. 27. 8 miles N 11° W of North Island, West Falkland Islands, 81–82 m. 2 specimens.

St. WS 82. 21. iii. 27. 54° 06′ S, 57° 46′ W, 140–144 m. 4 specimens.

St. WS 84. 24. iii. 27. 7·5 miles S 9° W of Sea Lion Island, East Falkland Islands, 75–74 m. 10 specimens.

St. WS 85. 25. iii. 27. 8 miles S 66° E of Lively Islands, East Falkland Islands, 74–75 m. 5 specimens.

St. 88. 6. iv. 27. 54° S, 64° 57′ W, 118 m. 2 specimens.

St. WS 93. 9. iv. 27. 7 miles S 80° W of Beaver Island, West Falkland Islands, 133–130 m. 1 specimen.

St. WS 94. 16. iv. 27. 50° S, 64° 57′ W, 110–126 m. 5 specimens.

St. WS 95. 17. iv. 27. 48° 58′ S, 64° 45′ W, 109–108 m. 1 specimen.

St. WS 210. 29. v. 28. 50° 17′ S, 60° 06′ W, 161 m. 2 specimens.

St. WS 211. 29. v. 28. Same position as WS 210. 161–174 m. 3 specimens.

St. WS 212. 30. v. 28. 49° 22′ S, 60° 10′ W, 242–249 m. 8 specimens.

St. WS 216. 1. vi. 28. 47° 37′ S, 60° 50′ W, 219–133 m. 14 specimens.

St. WS 218. 2. vi. 28. 45° 45′ S, 59° 35′ W, 311–247 m. 1 specimen.

St. WS 219. 3. vi. 28. 47° 06′ S, 62° 12′ W, 116–114 m. 1 specimen.

St. WS 225. 9. vi. 28. 50° 20′ S, 62° 30′ W, 162–161 m. 6 specimens (young).

St. WS 228. 30. vi. 28. 50° 50′ S, 56° 58′ W, 229–236 m. 1 specimen.

St. WS 229. 1. vii. 28. 50° 35′ S, 57° 20′ W, 210–271 m. 7 specimens.

St. WS 236. 6. vii. 28. 46° 50′ S, 60° 40′ W, 272–300 m. 1 specimen.
St. WS 237. 7. vii. 28. 46° 00′ S, 60° 05′ W, 150–256 m. 15 specimens.
St. WS 239. 15. vii. 28. 51° 10′ S, 62° 10′ W, 196–193 m. 1 specimen.
St. WS 243. 17. vii. 28. 51° 06′ S, 64° 30′ W, 144–141 m. Several specimens.
St. WS 244. 18. vii. 28. 52° 00′ S, 62° 40′ W, 253–247 m. Several specimens.
St. WS 248. 20. vii. 28. 52° 40′ S, 58° 30′ W, 210–242 m. 1 specimen.
St. WS 576. 17. iv. 31. 51° 35′ S, 57° 50′ W, 34–24 m. 1 specimen.
St. WS 583. 2. v. 31. 53° 39′ S, 70° 54′ W, 14–78 m. 1 specimen.
St. WS 755. 21. ix. 31. 51° 39′ S, 57° 39′ W, 75 m. Several specimens.
St. WS 764. 17. x. 31. 44° 38′ S, 61° 58′ W, 106–110 m. Several specimens.
St. WS 782. 4. xii. 31. 50° 28′ S, 58° 30′ W, 141–146 m. 4 specimens.
St. WS 795. 18. xii. 31. 46° 14′ S, 60° 24′ W, 157–161 m. 2 specimens.
St. WS 799. 21. xii. 31. 48° 04′ S, 62° 48′ W, 141–137 m. 1 specimen.
St. WS 801. 22. xii. 31. 48° 26′ S, 61° 28′ W, 165 m. 3 specimens.
St. WS 804. 6. i. 32. 50° 23′ S, 62° 49′ W, 150–143 m. 8 specimens.
St. WS 825. 28. i. 32. 50° 50′ S, 57° 15′ W, 135–144 m. 3 specimens.
St. WS 829. 31. i. 32. 50° 51′ S, 63° 13′ W, 155 m. 1 specimen.

The question whether *Notechinus* should be regarded simply as a synonym of *Pseudechinus*, as is the opinion of Clark (*op. cit.*, 1925), or whether it should be retained as a genus distinct from *Pseudechinus*, I intend to discuss in Part III of my Monograph of the Echinoidea. For the present, at least, I prefer to regard it as a separate genus, in accordance with the opinion of Döderlein.

Notechinus marionis, n.sp.

(Plate II, figs. 5–10; Plate IX, figs. 1–4)

St. 1562. 7. iv. 35. 46° 53′ S, 37° 55′ E, 97–104 m. Several specimens.
St. 1563. 7. iv. 35. 46° 48′ S, 37° 49′ E, 101–106 m. Several specimens.
St. 1564. 7. iv. 35. 46° 36′ S, 38° 02′ E, 108–113 m. 12 specimens.

These stations are all off Marion Island.

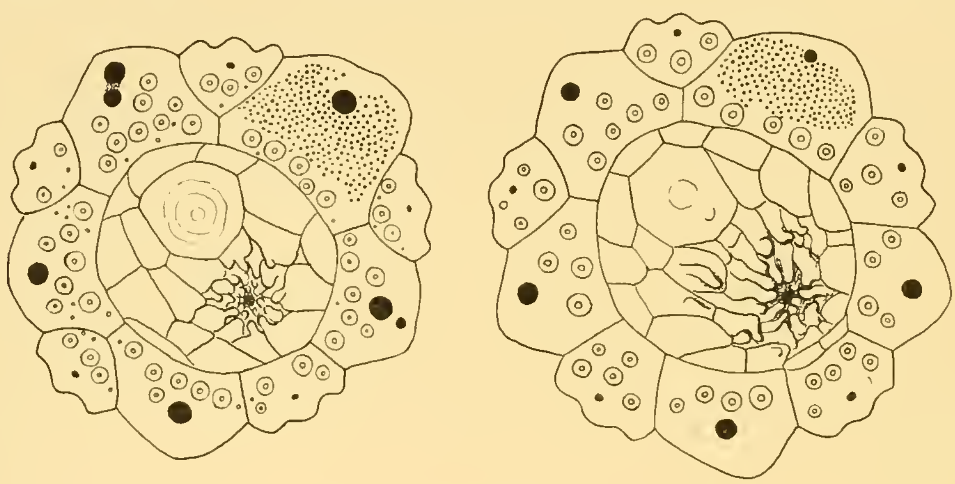
h.d. mm.	v.d. mm.	Apical system* mm.	Peristome mm.	Number of	
				A.	I.A.
25	12·2	7·5 (30 % h.d.)	9 (36 % h.d.)	20–21	13–14
24	12	7 (29·1 „)	9 (37·5 „)	20–21	13–14
22	10·5	6·8 (30·9 „)	8·5 (38·6 „)	20–21	12
21·5	11	6 (28 „)	8 (37·2 „)	19–20	12–13
19	9·5	6·5 (34·2 „)	7 (37 „)	18–19	11–12
16	8·5	4·5 (28·1 „)	6 (37·5 „)	17	11–12
15·5	7·5	5 (32·3 „)	6 (38·7 „)	16–17	11–12
13	7	4·5 (34·7 „)	5 (38·5 „)	15–16	10
12	6	3·5 (29·1 „)	5 (41·7 „)	15	11

* Measured along the longest axis, Oc. I, Gen. 3.

Largest specimens 27 mm. in diameter of test. The test is low, hemispherical, the circumference circular or rounded pentagonal; it is only slightly sunken towards the peristome.

Primary ambulacral tubercles distinctly smaller than the interambulacral primaries; they are confluent till well above the ambitus. In the largest specimens the secondaries along the median line are slightly enlarged so as to indicate median series. Primary interambulacral tubercles confluent up to the ambitus. In the largest specimens the secondaries are somewhat enlarged at the ambitus, forming fairly conspicuous secondary series, sometimes also outside the primary series, but these outer tubercles are somewhat smaller than those inside the primary series. Rarely there may be two enlarged secondary tubercles inside the primary one, these three then forming together an oblique, upward-turning series on each plate at the ambitus (Plate II, fig. 10). There is no naked median space in either ambulacra or interambulacra.

The apical system is fairly large, *ca.* 30 per cent of the horizontal diameter of the disk. Oc. I is insert, as usual in *Notechinus*, but often Oc. II and V, or even also Oc. IV, are insert. There is a rather broad naked outer margin on the apical plates. The periproct is rather large, the plates very characteristically thin and flat, and perfectly smooth. The



a *b*

Fig. 1. Apical system of *Notechinus marionis*, n.sp., ×9.

suranal plate is, except in the small specimens, from a size of *ca.* 14 mm. h.d., usually separated from the edge of the periproct by a series of small plates (Fig. 1 *a*, *b*). It usually shows some concentric striations. The small plates round the anal opening are raised into small papillae. The peristome, as typical of the genus, is wholly devoid of plates outside or inside the buccal plates; some few, very slender bihamate spicules are found in the distal part.

Spines rather slender, not exceeding a length of *ca.* 10 mm., even in the largest specimens; those around the peristome slightly curved. Secondary spines slender, but, as typical of the genus, not pointed. Pedicellariae as typical of the genus. The large globiferous pedicellariae may have up to three teeth along either side of the blade; but equally often there are only one or two. The small globiferous pedicellariae with one tooth on either side (Plate IX, figs. 2, 3). Both sorts of globiferous pedicellariae on the whole rather numerous. Tridentate pedicellariae exceedingly scarce, often totally lacking. They

are small, of the usual form, as are also the ophicephalous and triphyllous pedicellariae. Only very few bihamate spicules in the intestinal walls, but the walls of the (coalesced) gonads are studded with large bihamate spicules. Colour of the spines whitish. The denuded test white with a faint greenish or brownish tint on the aboral side. The periproct white, rarely with a tinge of greenish on the suranal plate.

Particularly by the character of its periproct and by its colour this species is very well distinguished from the two other species of *Notechinus* hitherto known, *N. magellanicus* (Philippi) and *novae-zealandiae*, Mortensen. Also the number of interambulacral plates is smaller. It might have been expected that these specimens from off Marion Island would prove to be identical with the variety *novae-amsterdamiae* described by Döderlein (Deutsche Tiefsee-Exped. Echinoiden, p. 229) from New Amsterdam, and Döderlein (*op. cit.*) expressed the opinion that the specimens from off Marion Island and Prince Edward Island taken by the 'Challenger' and identified by Agassiz as *Echinus magellanicus* (Challenger Echinoids, p. 116) would belong to the var. *novae-amsterdamiae.* Without having seen these specimens I venture to say that they will most probably belong to the present species, *Notechinus marionis.* The fact that H. L. Clark (Cat. Recent Sea-Urchins Brit. Mus., p. 118) states their colour to be "very light" is in favour of this suggestion, but re-examination of the specimens is necessary for definitely settling this question.

Loxechinus albus (Molina)

Loxechinus albus, Mortensen, 1910. Swedish South Polar Exped. Echinoidea, p. 52, pls. vi, figs. 1–6; viii; xvi, figs. 2, 4–5, 14, 16–17.
L. albus, H. L. Clark, 1925. Cat. Recent Sea-Urchins Brit. Mus., p. 134.
L. albus, Bernasconi, 1925. Result. Primera Exped. a Tierra del Fuego. Equinodermos, I, p. 7, Lam. i, figs. 4–6.

St. 982. 18. x. 32. Sholl Bay, Cockburn Channel, Magellan Strait. Littoral. 1 specimen.

Parechinus angulosus (Leske)

Parechinus angulosus, Mortensen, 1903. Danish 'Ingolf' Exped. Echinoidea, I, p. 108.
Protocentrotus angulosus, Döderlein, 1906. Deutsche Tiefsee-Exped. Echinoiden, p. 204, Taf. xxvii, figs. 6–8; xxxv, fig. 16; xlvii, fig. 6.
Parechinus angulosus, H. L. Clark, 1925. Cat. Recent Sea-Urchins Brit. Mus., p. 117.

1926. Saldanha Bay. Beach collection. 6 specimens.
8. ix. 26. Simons Town, Cape Peninsula, 0–2 m. 1 specimen.
St. 90. 11. vii. 26. Simons Town. Cape Peninsula, 1–2 m. 7 specimens.

I must join Clark in regarding the species *angulosus* as the type of the genus *Parechinus*, Döderlein's genus *Protocentrotus* thus becoming a synonym of *Parechinus*.

Family ECHINOMETRIDAE

Echinometra lucunter (Linn.)

Echinometra lucunter, Mortensen, 1933. *Echinoderms of St Helena* (*other than Crinoids*). Papers from Dr Th. Mortensen's Pacific Exped., 1914–16, LXVI (Vid. Medd. Dansk Naturh. Foren., 93), p. 468.

For other literary references, see the paper quoted.

St. 2. 17. xi. 25. Clarence Bay, Ascension. Littoral. 4 specimens.
St. 271. 29. xi. 27. Elephant Bay, Angola. Littoral. 2 specimens.

As for the identification of these specimens as *E. lucunter* I may refer to the remarks given in my St Helena Echinoderms, *loc. cit.* I expect that a thorough revision of the Echinometras will give the result that these mid-Atlantic and West African specimens are not simply identical with the West Indian *E. lucunter*. But this is not the place for such revision; I hope to give it in Part III of my Monograph of the Echinoidea.

Family HEMIASTERIDAE

Abatus cavernosus (Philippi)

(Plate III, figs. 11, 12)

Abatus cavernosus, Mortensen, 1910. Swedish South Polar Exped. Echinoidea, p. 70, pls. ix; x, figs. 2, 4, 6–8, 10–13; xvii, fig. 9; xviii, figs. 3–4; xix, figs. 28–30, 32–33, 35–39, 41–43, 45–46, 50–51.

A. cavernosus, H. L. Clark, 1917. Hawaiian Echini. Echinoneidae...Spatangidae, p. 175.

A. cavernosus, H. L. Clark, 1925. Cat. Recent Sea-Urchins Brit. Mus., p. 205.

A. cavernosus, Bernasconi, 1925. Result. Primera Exped. a Tierra del Fuego. Equinodermos. i. Echinoidea, p. 12, Lam. ii, figs. 4–6.

A. cavernosus, Koehler, 1926. Austral. Antarct. Exped. Echinod. Echinoidea, VIII, iii, p. 53, pl. cix, figs. 1–4, 6–8.

A. cavernosus, Grieg, 1929. *Echinodermata from the Palmer Archipelago, South Shetlands, South Georgia and Bouvet Islands*, Sci. Results Norwegian Antarct. Exped. 1927–8 and 1928–9, II, p. 12.

A. cavernosus, Grieg, 1929. *Some Echinoderms from the South Shetlands.* Bergens Mus. Årbok, 1929, III, p. 8.

A. cavernosus, Tortonese, 1933. *Gli Echinodermi del Museo di Torino. I. Echinoidi.* Boll. Mus. Zool. Torino, XLIII, p. 160, Tav. xi, fig. 48.

A. cavernosus, Tortonese, 1934. *Asterie ed Echini della Patagonia e della Tierra del Fuoco.* Boll. Mus. Zool. Torino, XLIV, p. 12.

The literature prior to 1910 has been dealt with in my work on the Echinoids of the Swedish South Polar Expedition, where a revision of the *Abatus* species and related forms was given, clearing up so far as possible the confusion till then reigning in this group of Spatangoids. As for the older literature reference may be made to this revision, only the literary references to works after 1910 being given here. The statement of Grieg that *A. cavernosus* occurs at Kerguelen is evidently a mistake that has crept in from the old literature.

St. 27. 15. iii. 26. West Cumberland Bay, South Georgia, 110 m. 1 young specimen.
St. 28. 16. iii. 26. West Cumberland Bay, South Georgia, 168 m. 3 specimens.
St. 30. 16. iii. 26. West Cumberland Bay, South Georgia, 251 m. Several specimens.

St. 39. 25. iii. 26. East Cumberland Bay, South Georgia, 179–235 m. Several specimens.
St. 42. 1. iv. 26. Off Cumberland Bay, South Georgia, 120–204 m. 5 specimens.
St. 45. 6. iv. 26. East of Jason Island, South Georgia, 238–270 m. 8 specimens.
St. 140. 23. xii. 26. Stromness Harbour to Larsen Point, South Georgia, 122–136 m. 8 young specimens.
St. 142. 30. xii. 26. East Cumberland Bay, South Georgia, 88–273 m. Several specimens.
St. 146. 8. i. 27. 53° 48′ S, 36° 02′ W, South Georgia, 728 m. 1 young specimen(?).
St. 148. 9. i. 27. Off Cape Saunders, South Georgia, 132–148 m. 2 very young specimens.
St. 167. 20. ii. 27. Off Signy Island, South Orkney Islands, 244–344 m. 1 medium-sized, 1 large, 9 small specimens.
St. 182. 14. iii. 27. Schollaert Channel, Palmer Archipelago, 278–500 m. 2 very young specimens.
St. WS 32. 21. xii. 26. Mouth of Drygalski Fjord, South Georgia, 91–225 m. 1 specimen.
St. WS 62. 19. i. 27. Wilson Harbour, South Georgia, 26–83 m. Several specimens.
St. MS 15. 17. ii. 25. East Cumberland Bay, South Georgia, 109 m. 9 specimens.
St. MS 68. 2. iii. 26. East Cumberland Bay, South Georgia, 220–247 m. Several specimens.
St. MS 69. 5. iii. 26. East Cumberland Bay, South Georgia, 146 m. 1 specimen.

Attention should be called to the rather extraordinary variation which occurs in this species (as in *Amphipneustes Lorioli*) in regard to the size of the marsupia; they may, indeed, be twice as large in one specimen as in another. Also in the males the depth of the petals varies very considerably, and they are sometimes so deep that one would rather think them to be female marsupia. The small size of the genital pores shows, however, that they are actually males (as I have also verified by an examination of the gonads).

The extraordinary development of the marsupia in the female is best realized by inspection of the interior side of the test. Plate III, figs. 11, 12 represent the inside of the test of a female and a male.

The commensal bivalve Mollusc occurring on this species has been described by Grieg (Echinoderms from the Palmer Archipelago, p. 14) under the name of *Montacuta Christenseni*. In my work of 1910, p. 73, I stated that, according to information given me by Mr H. Lynge, it should belong to the genus *Lepton*.[1] This apparent discrepancy is due to the fact that *two different sorts* of bivalves are found commensally on this Spatangoid. By far the commoner is the *Lepton*, with perfectly smooth valves. The *Montacuta* with radiating ribs, as described by Grieg, I have found only on the specimen from St. 142. I have not found both the commensals together on the same specimens of the sea-urchin. The *Lepton* in particular often occurs in great numbers, almost filling up the petals, and the apical system is often completely covered by them. The tests of the *Lepton* are so exceedingly thin as to leave no trace when the specimens are dried. That this is not due to the preserving fluid having been acid is evident from the fact that the finest details of the valves of the pedicellariae are intact.

Very young specimens of this Echinoid, when found isolated, are not identifiable with complete certainty; this applies, for example, to the specimens from Sts. 140 and 148

[1] Bernasconi (*op. cit.*, p. 16) also records such bivalves, and these were identified by Professor Duello Jurado as belonging to the genus *Lepton*.

and perhaps also to the young specimens from St. 167. On the whole it is scarcely possible to distinguish with certainty between *Abatus cavernosus* and *A. Philippii* in the young stages; but when, as is often the case, only *A. cavernosus* is represented among the adults from some station, the young ones occurring with them may no doubt be regarded as belonging to this species also.

The specimen from St. 146, a young one 14 mm. in length, has the rostrate pedicellariae remarkably diversified; its identification as *A. cavernosus* I must regard as quite uncertain, though its globiferous pedicellariae are of the *cavernosus* type. It has two subanal tube feet developed. The great depth, 728 m., is also unusual for *cavernosus*. It is possible that it is really a new species of *Abatus*, but to base a new species of the difficult genus *Abatus* on a single young specimen I would think unreasonable.

Abatus cavernosus, var. bidens, Mortensen

(Plate III, fig. 10; Plate IX, figs. 9–11)

Abatus cavernosus, var. *bidens*, Mortensen, 1910. Swedish South Polar Exped. Echinoidea, p. 73, pl. xix, figs. 32, 35, 39, 42.

St. 39. 25. iii. 26. East Cumberland Bay, South Georgia, 179–235 m. 2 specimens.
St. MS 15. 17. ii. 25. East Cumberland Bay, South Georgia, 110 m. 1 specimen.

The information about *A. elongatus* (Koehler) given below, p. 227, shows that the present form has nothing to do with that species, as might be suggested. Perhaps it would be more correct to regard this form as a separate species.

Abatus curvidens, n.sp.

(Plate III, fig. 9; Plate IX, figs. 17–20)

St. 181. 12. iii. 27. Schollaert Channel, Palmer Archipelago, 160–335 m. 1 specimen.
St. 182. 14. iii. 27. Schollaert Channel, Palmer Archipelago, 278–500 m. 1 specimen.

Length mm.	Breadth mm.	Height mm.
42	37	24
36	34	23

The larger specimen, which is the holotype, is a male, in a very good state of preservation; the smaller specimen is a female, somewhat broken.

Test low, but somewhat hemispherical, the apex being slightly anterior; it is distinctly broader in the anterior part, with a notch at the frontal ambulacrum, which is only slightly sunken. The posterior petals are about two-thirds the length of the anterior ones. Both of them are transformed into marsupia in the female. The peripetalous fasciole is on the very edge of the test anteriorly; some little distance behind the anterior petals it bends sharply inwards; the posterior part of the fasciole, across the posterior interambulacrum, is nearly straight. The posterior edge of the test slopes slightly downwards. The labrum, which is rounded, extends backwards to opposite the middle of the second adjoining ambulacral plates. The peristome not much sunken. Four well-developed subanal tube feet.

The globiferous pedicellariae are very numerous in the type specimen along all the ambulacra inside the fasciole; a good number also occur on the posterior interam-

bulacrum, behind the fasciole. They are very conspicuous on account of their dark colour, the general colour of the specimen being a light brownish. In the smaller specimen they are not nearly so numerous and are much less conspicuous, due to the specimen having been dried. The valves (Plate IX, figs. 19, 20) are small, elegantly curved (the species name *curvidens* refers to this feature), terminating in two or three long slender teeth; the number of the teeth appears to be more generally two, but it is by no means rare to find three of them. Often there is an irregular hump on the dorsal side of the valves. The rostrate pedicellariae are small; the valves are curved at the end, which is somewhat constricted, and have only two to four short teeth, sometimes none at all (Plate IX, fig. 18). Along the sides of the valves there are usually some rather coarse serrations. The tridentate pedicellariae, which do not reach any large size, only *ca.* 0·5 mm. length of head, have broad simply leaf-shaped valves (Plate IX, fig. 17). There are no two-valved pedicellariae. The triphyllous pedicellariae are just like small tridentate ones.

It is quite evident that this form cannot be referred to any of the rather numerous species of the genus *Abatus* hitherto known. One of these species was insufficiently known, viz. *A. elongatus* (Koehler), the description and figures of this species given by Koehler in his record of the Echinoderms of the Scotia Expedition (Trans. Roy. Soc. Edinb., XLVI, 1908, p. 618, pl. xvi, figs. 145–58) being not all that could be desired. Thus nothing is said about the important character whether subanal tube feet are present or not. As one of the co-types has very kindly been sent me for re-examination from the Edinburgh Museum, I take the opportunity of supplying here some information of this species; from this it appears that *A. elongatus* is a distinct species, not identical with *A. Agassizii*, as I formerly suggested (Swedish South Polar Exped. Echinoidea, p. 86). The specimen is unfortunately badly broken and the exact number of the subanal tube feet cannot be stated, but there are at least three of them. The labrum ends opposite the second adjoining ambulacral plate. The figures of the pedicellariae given by Koehler are rather crude, so I have taken the opportunity of giving some new figures of them (Plate IX, figs. 12–16). It was particularly Koehler's fig. 155, said to represent a rostrate pedicellaria, that I found strange and remarkably different from the rostrate pedicellariae of other species of *Abatus*. They proved to be tridentate pedicellariae of the characteristic restricted form often occurring with two valves (here only three-valved samples were found) (Plate IX, fig. 16). The rostrate pedicellariae are of quite another shape (Plate IX, fig. 14) and were overlooked by Koehler. The characters of the pedicellariae show beyond doubt that the present species is entirely different from Koehler's "*Hemiaster*" *elongatus*.[1]

Of the other species of *Abatus* with bidentate globiferous pedicellariae, *A. bidens*, Mortensen, *A. Shackletoni*, Koehler, *A. Agassizii* (Pfeffer), and *A. ingens*, Koehler, the

[1] The species name *elongatus* was changed by Thiéry into *Koehleri*, because a (fossil) *Hemiaster elongatus* had already been described. Since, however, Koehler's species does not belong to *Hemiaster*, but to the genus *Abatus*, there is no need to change the specific name. In this I quite agree with Koehler (Austral. Antarct. Exped. Echinod. Echinoidea, p. 55).

three latter differ in the absence of subanal tube feet (besides other characters). As for *A. bidens* (which as stated above, p. 226, is perhaps better regarded as a separate species than as a variety of *A. cavernosus*) it differs markedly in the form of the pedicellariae, as seen from the figures given here for comparison (Plate IX, figs. 9–11).

Abatus Philippii, Lovén

Abatus Philippii, Lovén, 1871. *Om Echinoideernas byggnad*. Öfvers. Vet. Akad. Förh., VIII, p. 6.
A. Philippii, Mortensen, 1910. Swedish South Polar Exped. Echinoidea, p. 83, pls. xi, figs. 6, 9–13; xix, fig. 47.
A. Philippii, H. L. Clark, 1917. Hawaiian Echini. Echinoneidae...Spatangidae, p. 175.
For other literary references see my work on the Echinoidea of the Swedish South Polar Expedition, *loc. cit.*

St. 181. 12. iii. 27. Schollaert Channel, Palmer Archipelago, 160–335 m. 1 specimen and fragment (dorsal side) of another. Both are males; still, I do not think the identification as *A. Philippii* doubtful.

The validity of *A. Philippii* as a distinct species is somewhat uncertain. Clark (*op. cit.*, 1917) suggests that it may be based only on specimens of *A. cavernosus* in which the posterior petals have not yet been transformed into marsupia. The material at my disposal does not support Clark's suggestion that the marsupia of the female do not develop contemporaneously, but that the anterior ones develop first and the posterior ones later. Thus in a couple of specimens of 30–32 mm. length I find all the marsupia equally developed, though not very deep as yet, the specimens being not yet mature, as is evident from an examination of the gonads. On the other hand, the fact that *A. Philippii* appears to be on the whole of rare occurrence tends to support Clark's suggestion. It may also be possible that the forms with only the anterior petals transformed into marsupia may represent aberrant specimens of *cavernosus*. However this may be, I think it desirable for the present to designate these specimens with only the anterior petals transformed into marsupia under the name *A. Philippii*, whether it be a "forma", an "aberratio", a variety, or a true species.

Abatus Agassizii (Pfeffer)

Abatus Agassizii, Mortensen, 1910. Swedish South Polar Exped. Echinoidea, p. 86, pls. x, figs. 1, 3, 5, 9, 14; xix, fig. 4.
A. Agassizii, H. L. Clark, 1917. Hawaiian Echini. Echinoneidae...Spatangidae, p.176.
? *A. Agassizii*, H. L. Clark, 1925. Cat. Recent Sea-Urchins Brit Mus., p. 204.

St. 55. 16. v. 26. Entrance to Port Stanley, East Falkland Islands, 10–16 m. 1 young specimen.
St. 388. 16. iv. 30. 56° 19′ S, 67° 10′ W, 121 m. 1 specimen.
St. WS 25. 17. xii. 26. Undine Harbour, South Georgia, 18–27 m. 2 young specimens.
22. x. 34. Weir Creek, Falkland Islands, 3·5 m. 3 young specimens.

Although these specimens are quite young, 5–18 mm. long, I have no doubt that the identification is correct. The absence or feeble development of the subanal tube feet affords a marked difference, particularly from *A. cavernosus*, in which these tube feet are already well developed in specimens which have just left the marsupium. As for the

specimens from Heard Island and the Ross Sea referred by Clark (*op. cit.*, 1925) to *A. Agassizii* I think it questionable whether they are actually *A. Agassizii*, and Clark expressed himself with some reservation on this point.

Globiferous pedicellariae were not found in any of these specimens, this type of pedicellaria being thus still unknown in *A. Agassizii.*

This species was hitherto known with certainty only from South Georgia; the finding of it at the Falkland Islands by the 'Discovery' is thus of considerable interest.

Schizaster (Tripylaster) Philippii (Gray)

Tripylus Philippii, Gray, 1855. Cat. Recent Echinida Brit. Mus. I, Irregularia, p. 59, pl. v, fig. 1.

Schizaster Philippii, A. Agassiz, 1872. Revision of the Echini, p. 612, pl. xxvi, figs. 40, 41.

S. (Tripylaster) Philippii, Mortensen, 1907. Danish 'Ingolf' Exped. Echinoidea, II, pp. 122, 123.

S. (Tripylaster) Philippii, Mortensen, 1910. Swedish South Polar Exped. Echinoidea, p. 90, pls. xii, figs. 8, 10–11; xix, figs. 5, 7, 15–16, 21, 31, 48–49.

Tripylaster Philippii, H. L. Clark, 1917. Hawaiian Echini. Echinoneidae...Spatangidae, p. 177.

For other literary references see my work of 1910, *loc. cit.*

St. 51. 4. v. 26. Off Eddystone Rock, East Falkland Islands, 105–115 m. 1 dead test.

St. WS 83. 24. iii. 27. 14 miles S 64° W of George Island, East Falkland Islands, 137 m. 1 specimen.

St. WS 785. 6. xii. 31. 49° 25′ S, 62° 37′ W, 150 m. 1 specimen.

The specimen from St. WS 83 is of medium size, 60 mm. long, 52 mm. broad. That from St. 51, which is an old, dead test, partly covered with worm tubes, is 77 mm. long, 72 mm. broad, thus distinctly broader than the younger specimen. I see, however, no reason to doubt their identity, such variation in shape being of common occurrence in most species. In the specimen from St. WS 83 I find the pedicellariae of the typical shapes, as described in my work on the Echinoidea of the Swedish South Polar Expedition. The specimen from St. WS 785 is almost totally denuded, only a couple of small tridentate pedicellariae being left. But it is evidently a typical *T. Philippii.*

Amphipneustes Koehleri, Mortensen

Amphipneustes Koehleri, Mortensen, 1910. Swedish South Polar Exped. Echinoidea, p. 94, pls. xi, figs. 2–5, 7, 8, 15, 18; xvii, figs. 10–11; xviii, figs. 1–2; xix, figs. 3–4, 8–9, 13–14, 19–20, 23–25, 27.

A. Koehleri, H. L. Clark, 1917. Hawaiian Echini. Echinoneidae...Spatangidae, p. 163.

A. Koehleri, H. L. Clark, 1925. Cat. Recent Sea-Urchins Brit. Mus., p. 198.

St. 27. 15. iii. 26. West Cumberland Bay, South Georgia, 110 m. Several specimens.

St. 42. 1. iv. 26. West Cumberland Bay, South Georgia, 120–204 m. 5 specimens.

St. 126. 19. xii. 26. 53° 58′ 30″ S, 37° 08′ W, 100(–0) m. 1 specimen.

St. 140. 23. xii. 26. Stromness Harbour to Larsen Point, South Georgia, 122–136 m. Several specimens.

St. 144. 5. i. 27. Off mouth of Stromness Harbour, South Georgia, 155–177 m. 1 specimen.

St. 148. 9. i. 27. Off Cape Saunders, South Georgia, 132–148 m. 4 specimens.

St. 160. 7. ii. 27. Near Shag Rocks, South Georgia, 177 m. 2 specimens.

St. 474. 12. xi. 30. 1 mile W of Shag Rocks, South Georgia, 199 m. Several specimens.

St. WS 33. 21. xii. 26. 54° 59′ S, 35° 24′ W, 130 m. 4 specimens.

None of the present specimens exceed a length of 33 mm. As none of the other specimens known exceed a length of 38 mm. (the type specimen) it is evident that this is about the maximum size of this species, which is, accordingly, noticeably smaller than the other species of the genus *Amphipneustes*.

In my description of this species (*op. cit.*, 1910) I was unable to decide whether young specimens have a fasciole. The large material now at hand, containing specimens of all stages, allows this question to be settled. As was to be expected there is not the slightest trace of a fasciole at any stage of development and growth.

In the type specimen (*op. cit.*, p. 96, pl. xi, fig. 18) the labrum was found to reach as far backwards as the middle of the second ambulacral plate. This is a rather unusual condition. Generally it reaches only to the middle of the first ambulacral plate; but it is sometimes more elongate, so as to reach to the middle of the second ambulacral plate. This has nothing to do with age; the elongate condition of the labrum may be found in quite young specimens and, on the other hand, the short labrum in adult specimens. Sometimes the labrum ends opposite the middle of the first ambulacral plate on one side, of the second on the other side; in such a case the first ambulacral plate on the one side is conspicuously produced posteriorly.

The genital pores appear at a size of about 12–15 mm. length.

It would appear that the embryos leave the marsupium at a somewhat earlier stage than in *A. Lorioli* or *similis*.

Amphipneustes Lorioli, Koehler

(Plate III, figs. 5–8; Plate IV, fig. 8; Plate IX, fig. 27)

Amphipneustes Lorioli, Koehler, 1901. Result. Voyage 'Belgica'. Echinides et Ophiures, p. 12, pls. ii, fig. 12; v, fig. 37; vi, figs. 42, 43.

A. Lorioli, Mortensen, 1910. Swedish South Polar Exped. Echinoidea, p. 91, pls. xi, figs. 17, 19; xix, figs. 1–2, 6, 10–12, 17, 22, 26.

A. Mortenseni, Koehler, 1912. IIe Expéd. Antarct. Française. Echinodermes, p. 176, pl. xv, figs. 11–17; xvi, figs. 1–5.

A. Lorioli, H. L. Clark, 1917. Hawaiian Echini. Echinoneidae...Spatangidae, p. 163.

A. Lorioli, H. L. Clark, 1925. Cat. Recent Sea-Urchins Brit. Mus., p. 198.

St. 181. 12. iii. 27. Schollaert Channel, Palmer Archipelago, 160–335 m. 4 specimens.
St. 182. 14. iii. 27. Schollaert Channel, Palmer Archipelago, 278–500 m. 4 specimens.
St. 600. 17. i. 31. 67° 09′ S, 69° 27′ W, off Adelaide Island, 487–512 m. 1 specimen.

Three of the specimens are females. As shown in Plate III, figs. 5, 6 and Plate IV, fig. 8, there is a conspicuous variation in the development of the petals; also the general shape of the large specimen (Plate III, fig. 6) is somewhat different from that of the other specimens, it being distinctly higher than the other specimens, and somewhat more flattened on top.

It is a curious fact that the marsupia of two of the specimens are quite empty; the third contains only very few embryos and eggs, three stages of development being represented. The largest embryos, which are 3 mm. long and just ready to leave the marsupium, do not show any trace of a fasciole. Pedicellariae have not yet been

formed; I have found only what appears to be the first rudiment of a globiferous pedicellaria.

One of the specimens has the madreporite separated from the right anterior genital plate, as was the case in the type specimen; in all the other specimens there is no line separating the madreporite from the right anterior genital. All the specimens have three genital pores, the existence of four genital pores in the type specimen being evidently an anomaly.

Globiferous pedicellariae, which were hitherto only very imperfectly known in this species, are found well developed. They are of a highly characteristic structure, the valves terminating in a number of quite short teeth (Plate IX, fig. 27), a type not known from any other species of the *Amphipneustes-Abatus* group. As for the other pedicellariae I may refer to the description and figures given in my report on the Echinoids of the Swedish South Polar Expedition.

I must regard it as almost certain that the *A. Mortenseni*, Koehler, is not to be maintained as a species separate from *A. Lorioli*. The former being known only from a female specimen, the latter from a couple of male specimens, it was of course not easy to point out exactly by which characters the two species differed from each other; but Koehler thinks the pedicellariae show sufficient differences to prove that the two forms represent different species. It is remarkable that Koehler could have reached this conclusion. Only tridentate and rostrate pedicellariae were known at that time, and they are absolutely identical. In the shape and structure of test the two "species" are exactly alike, apart from the difference due to the different sexes. There only remains the question of the globiferous pedicellariae. In my report on the Echinoids of the Swedish South Polar Expedition (pp. 93–4) I mention having found in *A. Lorioli* one, very poorly preserved, globiferous pedicellaria that seemed to be of the same structure as the globiferous pedicellariae of *A. Koehleri*: that is to say with the valves terminating in two long teeth and thus conspicuously different from those here figured. But it is stated that "the valves have in addition to the two large teeth in the point one or two shorter teeth". This might indicate that they are actually different from those of the present specimens. If so, the present specimens are not identical with *A. Lorioli*, but should be referred to *A. Mortenseni*, since it is a fact that the globiferous pedicellariae in these forms afford excellent specific characters. But until it is definitely proved that in the forms described respectively as *A. Lorioli* and *A. Mortenseni* we have two different types of globiferous pedicellariae, I must believe that both belong to one species, the name of which must be the older, viz. *A. Lorioli*. I may add that I have had an opportunity of examining the type of *A. Mortenseni* in the Paris Museum; unfortunately not a single globiferous pedicellaria is left on it.

Amphipneustes similis, n.sp.

(Plate IV, figs. 1–7; Plate IX, figs. 21–26)

St. 170. 23. ii. 27. Off Cape Bowles, Clarence Island, 342 m. 1 specimen.
St. 180. 11. iii. 27. Schollaert Channel, Palmer Archipelago, 160–330 m. 2 specimens.
St. 182. 14. iii. 27. Schollaert Channel, Palmer Archipelago, 278–500 m. 3 specimens.

The outline of the test is almost regularly oval; the height varies rather considerably, as seen from the measurements. Particularly the specimen from St. 170 (no. 5 in the table below) is unusually low. The apical system is central, but the greatest height is behind the apical system, the posterior interambulacrum rising as a more or less prominent keel. The periproct is situated on the slightly truncated posterior end, scarcely visible from below. The labrum is rather prominent, the peristomial part of the test rather conspicuously sunken; the plastron is quite flat.

	Length mm.	Height mm.	Width mm.	Length of petals mm.		
				Antero-lateral	Postero-lateral	
1	72	40	63	28	26	♂ } Holotypes
2	72	44	62	28	25	♀ } Holotypes
3	65	34	57	22	21	♀ } Cotypes
4	61	31	53	24	23	♂ } Cotypes
5	54	25	47	14	14	

The petals of the male are rather distinctly sunken, the postero-lateral ones more so than the antero-lateral ones. The frontal ambulacrum distinctly petaloid and almost as much sunken as the antero-lateral petals. In the female the paired petals are transformed into deep marsupia, the width of which varies very conspicuously, as seen in Plate IV, figs. 2, 5.

The interambulacra are more or less raised, the posterior one, as stated, forming a keel, which may be quite sharp or more rounded. The sternum is narrow, gently widening towards the posterior end. The madreporite is small. There are usually three genital openings, but the specimen from St. 170 and one of those from St. 182, both females, have only two. In the former specimen the right anterior marsupium is undeveloped (Plate IV, fig. 3); this specimen accordingly is somewhat abnormal.

The spines form a uniform, not very dense covering, among which the numerous, black globiferous pedicellariae in well-preserved specimens stand out very conspicuously on the aboral side.

The valves of the globiferous pedicellariae terminate in five long, slender teeth, as in *Parapneustes* (Plate IX, figs. 22, 23). The rostrate and tridentate pedicellariae also are of the same type as in *Parapneustes*, but there is some variation in the shape of the rostrate form (Plate IX, fig. 26).

The colour is a light brownish.

The young ones in the same marsupia are in all stages, from the egg to the fully formed young (14 mm.) ready to leave the marsupium.

In the female holotype the frontal ambulacrum is somewhat abnormally bent (Plate IV, fig. 2).

This is a very perplexing species. It agrees almost completely in every respect with *Parapneustes reductus*, Koehler—but there is no trace of fascioles, whereas the fascioles,

according to Koehler, are particularly well developed in *P. reductus*, better so than in the species *P. cordatus*. The fact that the fascioles in Koehler's figure of *P. reductus* in side view (*op. cit.*, pl. xvi, 14) seem to have been retouched on the photo, whereas figs. 12 and 13 of the same plate, showing the same specimen from above and in end view, do not show any trace of fascioles, might lead one to suggest that some mistake has crept into the representation of the species. Having had an opportunity of re-examining the type specimen in the Paris Museum I can, however, testify to the correctness of Koehler's description and figures. The fasciole has been marked with a black line on the specimen, not on the photo; but it is quite distinctly seen on the specimen.

It might, of course, be suggested that fascioles were originally present in the Discovery specimens, but have been reduced in the course of development. If so, one would expect a fasciole to be developed in the young ones ready to leave the marsupium. There is, however, no trace of a fasciole in the young specimens from the marsupium in the present species. These specimens, it may be added, have the globiferous pedicellariae typically developed.

The present species forms a most remarkable parallel to *P. reductus*; but the character of the fascioles, entirely absent in one and distinctly developed—though very thin—in the other, shows definitely that the two forms belong to two distinct genera.

Parapneustes cordatus, Koehler

(Plate III, figs. 1–4)

Parapneustes cordatus, Koehler, 1912. II[e] Expéd. Antarct. Française. Echinodermes, p. 165, pl. xvi, figs. 15–27.

P. cordatus, H. L. Clark, 1917. Hawaiian Echini. Echinoneidae...Spatangidae, p. 173.

St. 181. 12. iii. 27. Schollaert Channel, Palmer Archipelago, 160–335 m. 2 specimens.
St. 182. 14. iii. 27. Schollaert Channel, Palmer Archipelago, 278–500 m. 4 specimens.

Only a single, apparently male, specimen of this species was taken by the 'Pourquoi-Pas?'. Koehler's very careful description of this specimen could thus, of course, not be all that was to be desired and in particular the question whether this species is brood-protecting like most other Antarctic Spatangoids had to be left undecided. It is therefore most satisfactory that the 'Discovery' has secured some specimens in fair preservation, which give not only the solution of the question whether the species is brood-protecting, but also other very important information.

The specimens, which are all adult, 49–56 mm. in length, agree perfectly with the type specimen in regard to their general shape, only the restriction of the posterior part of the test is sometimes less pronounced. Also in the pedicellariae (particularly those remarkable globiferous pedicellariae with the valves terminating in five long and slender teeth) these specimens agree perfectly with the type. But in regard to the fascioles they differ conspicuously from the type specimen. Whereas this latter had only the peripetalous fasciole developed, the present specimens also have a latero-subanal fasciole. As a rule the peripetalous fasciole is fairly distinct, but it may be more or less reduced, sometimes more on one side than on the other; the latero-subanal fasciole is generally

distinct on the side of the test; the subanal part is sometimes quite reduced, sometimes very distinct. There is thus much variation in the development of the fascioles.

Both male and female specimens are found in this material, and, as was to be expected, the females have the paired petals transformed into deep marsupia, this species being thus also brood-protecting. The embryos contained in the same marsupium are in all stages of development, from newly laid eggs to fully formed young ones ready to leave the marsupium. The breeding thus appears to go on continuously, i.e. so long as the breeding season lasts; but of its duration we know nothing.

The young ones ready to leave the marsupium are already distinctly elongate, 3 mm. long, and have the peripetalous fasciole quite clearly developed. Pedicellariae have not yet appeared, but the first sphaeridia have been formed.

A specimen of 8 mm. length is characteristically elongate (6 mm. broad), almost rectangular. The circumlateral fasciole is well developed, but the transverse fasciole has only just begun to appear (cf. the development of the fascioles in the young *Abatus cavernosus*, as described in my report on the Echinoidea of the Swedish South Polar Expedition, pp. 75–83). The periproct is in this specimen still close to the apical system. Genital pores have, of course, not yet appeared. A couple of globiferous pedicellariae found on the aboral side, and a rostrate pedicellaria found on the posterior end of the test, make the identification of this specimen as a young *Parapneustes cordatus* quite certain.

One specimen, a male, is remarkable in having four genital pores, the madreporite also having a genital pore. The labrum is generally more pointed and narrow than shown in Koehler's pl. xvi, fig. 26; but both forms may occur, as shown in Plate III, figs. 3, 4, and it is not a sexual difference, as I find both the broad and the narrow form to occur in male specimens.

Family SPATANGIDAE

Echinocardium connectens, Mortensen

(Plate IV, figs. 9–10)

Echinocardium connectens, Mortensen, 1933. *The Echinoderms of St Helena (other than Crinoids)*. Papers from Dr Th. Mortensen's Pacific Exped. 1914–16, LXVI (Vid. Medd. Dansk Naturh. Foren., 93), p. 469.

St. 299. 4. ix. 27. Tarrafal, San Antonio, Cape Verde Islands, 7–11 m. 1 specimen.

This specimen is, at any rate, very closely related to the St Helena species, *E. connectens*, with which it agrees in the character of the frontal ambulacrum, the absence of larger spines (tubercles) above the ambitus, and in the character of the triphyllous pedicellariae. Unfortunately only triphyllous pedicellariae are found and these even are exceedingly scarce.

On account of the very scarce and insufficient material hitherto known of *E. connectens*, and with only a single specimen in hand of the present form, I do not like to state definitely that it is really identical with the species from St Helena, but I have little doubt about their identity. The specimen is 20 mm. long, 20 mm. broad and 14 mm.

high, the greatest height being behind the apical system. The frontal end is nearly vertical, the frontal ambulacrum only slightly sunken. The labrum reaches the second adjoining ambulacral plates; two tube feet are found within the subanal fasciole. There is a rather conspicuous fasciole along each side of the periproct.

Since no *Echinocardium* has hitherto been recorded from the West African coast (south of Morocco) the discovery of this specimen is of considerable interest. It is most desirable that further material of the species should be obtained in order that its identity may be definitely settled. As it is a shallow-water species which no doubt lives buried in sand or mud, it should not be difficult to collect it in sufficient numbers.

Plagiobrissus sp. (young)

St. 279. 10. viii. 27. Off Cape Lopez, French Congo, 58–67 m. 1 specimen.

This young specimen, which is only 5 mm. long, seems almost certainly to belong to the genus *Plagiobrissus*, and quite probably it is *Plagiobrissus Costae* (Gasco). But it is too young to be definitely identified.

From St. 933, 17. viii. 32, 260 m., there is a very young specimen of a Spatangoid which is quite unidentifiable; the whole oral side is lacking, so that it is not even possible to see whether it is an amphisternous or a meridosternous form.

Family URECHINIDAE

Plexechinus Nordenskjöldi, Mortensen

(Plate IX, figs. 5–7)

Plexechinus Nordenskjöldi, Mortensen, 1910. Swedish South Polar Exped. Echinoidea, p. 61, pls. xvii, figs. 1–8; xviii, figs. 5–12.
P. Nordenskjöldi, H. L. Clark, 1917. Hawaiian Echini. Echinoneidae...Spatangidae, p. 120.

St. 27. 15. iii. 26. West Cumberland Bay, South Georgia, 110 m. 1 specimen.
St. 140. 23. xii. 26. Stromness Harbour to Larsen Point, South Georgia, 122–136 m. 4 specimens.
St. 144. 5. i. 27. Off mouth of Stromness Harbour, South Georgia, 155–178 m. 2 specimens.
St. 148. 9. i. 27. Off Cape Saunders, South Georgia, 132–148 m. 1 specimen.

These specimens in general agree very well with the type, as described in my work of 1910; but the oral side can scarcely be said to be "somewhat deepened" in front of the peristome—there is hardly any depression at all to be observed here. Also it can hardly be said that the mouth opening is "almost vertical"; it can at most be said to be distinctly oblique. The largest of the specimens is 19 mm. long, thus a good deal larger than the type.

In regard to the pedicellariae it is remarkable that ophicephalous pedicellariae are lacking in all the present specimens; on the other hand, the tridentate pedicellariae are better developed, reaching a somewhat larger size than in the type (Plate IX, figs. 5–7).

In some of the specimens a number of specimens of a *Loxosoma* are found attached to the spines, mainly on the aboral side.

This very interesting little Echinoid is still known only from the vicinity of South Georgia.

OPHIUROIDEA

Family GORGONOCEPHALIDAE

Astrotoma Agassizii, Lyman

(Plate V, figs. 1, 2; Plate VI, figs. 1, 2)

Astrotoma Agassizii, Lyman, 1875. *Ophiuridae and Astrophytidae. Hassler Exped.* Ill. Cat. Mus. Comp. Zool., VIII, p. 24, pl. iv, figs. 52–56.

A. Agassizii, Koehler, 1908. Scott. Nat. Antarct. Exped. Astéries, Ophiures et Echinides, p. 614, pl. xiii, fig. 120.

A. Agassizii, Döderlein, 1911. Japanische und andere Euryalae, p. 100.

A. Agassizii, Koehler, 1922. Austral. Antarct. Exped. Echinod. Ophiuroidea, p. 9, pl. lxxvi, figs. 1–11.

A. Agassizii, Koehler, 1923. Swedish Antarct. Exped. Astéries et Ophiures, p. 102.

A. Agassizii, Fedotov, 1927. *Morphologische Studien an Euryalae.* Zeitschr. Morphol. Ökol. Tiere, IX, pp. 381–4.

A. Agassizii, Döderlein, 1927. Indopacifische Euryalae, p. 87.

A. Agassizii, Döderlein, 1930. Deutsche Tiefsee-Exped. Ophiuriden. II, Euryalae, p. 372, Taf. i, figs. 1, 1 *a*.

St. 39. 25. iii. 1926. East Cumberland Bay, South Georgia, 179–235 m. 2 large specimens.

St. 42. 1. iv. 26. Off mouth of Cumberland Bay, South Georgia, 120–204 m. 4 large specimens, 2 small ones.

St. 140. 23. xii. 26. Stromness Harbour to Larsen Point, South Georgia, 122–136 m. 8 specimens, large and small.

St. 144. 5. i. 27. Off mouth of Stromness Harbour, South Georgia, 155–178 m. 5 specimens.

St. 148. 9. i. 27. Off Cape Saunders, South Georgia, 132–148 m. 2 specimens.

St. 152. 17. i. 27. 53° 51′ S, 36° 18′ W, South Georgia, 245 m. 5 specimens.

St. 159. 21. i. 27. 53° 52′ S, 36° 08′ W, South Georgia, 160 m. 1 specimen.

St. 160. 7. ii. 27. Near Shag Rocks, South Georgia, 177 m. 15 specimens.

St. 345. 8. ii. 30. 55° 20′ S, 34° 47′ W, 200–100 m. 1 specimen.

St. 600. 17. i. 31. 67° 09′ S, 69° 27′ W, 501–527 m. 8 specimens.

St. 652. 14. iii. 31. Burdwood Bank, 171–169 m. 1 specimen.

St. WS 83. 24. iii. 27. 14 miles S 64° W of George Island, East Falkland Islands, 137–129 m. 1 specimen.

St. WS 84. 24. iii. 27. 7·5 miles S 9° W of Sea Lion Island, East Falkland Islands, 75–74 m. 1 specimen.

St. WS 85. 25. iii. 27. 8 miles S 66° E of Lively Island, East Falkland Islands, 79 m. 15 specimens (young).

St. WS 93. 9. iv. 27. 7 miles S 80° W of Beaver Island, West Falkland Islands, 133–130 m. 3 specimens.

St. WS 108. 25. iv. 27. 48° 31′ S, 63° 34′ W, 118–120 m. 1 specimen.

St. WS 243. 17. vii. 28. 51° 06′ S, 64° 30′ W, 144–141 m. 1 specimen.

St. WS 246. 19. vii. 28. 52° 25′ S, 61° 00′ W, 267–208 m. 3 specimens.

St. WS 248. 20. vii. 28. 52° 40′ S, 58° 30′ W, 210–242 m. 10 specimens.

St. WS 818. 17. i. 32. 52° 34′ S, 63° 13′ W, 278–284 m. 6 specimens.

St. WS 819. 17. i. 32. 52° 42′ S, 62° 39′ W, 312–329 m. 1 specimen.

St. WS 820. 18. i. 32. 52° 53′ S, 61° 51′ W, 351–367 m. 2 specimens.

St. WS 824. 19. i. 32. 52° 29′ S, 58° 27′ W, 146–137 m. 15 specimens.

St. WS 825. 28. i. 32. 50° 50′ S, 57° 15′ W, 135–144 m. 5 specimens.

St. WS 840. 6. ii. 32. 53° 52′ S, 61° 49′ W, 368–463 m. 2 specimens.

St. WS 871. 1. iv. 32. 53° 16′ S, 64° 12′ W, 336–341 m. 4 specimens.

The very rich material of *A. Agassizii* collected by the ships of the Discovery Committee gives us a much better idea of what a splendid form this Gorgonocephalid is than could be gathered from the specimens hitherto known. The largest of these, collected by the Australasian Antarctic Expedition (cf. Koehler, *op. cit.*, 1922), did not surpass a diameter of disk of 36 mm.—in the present material the largest specimen measures 60 mm. in diameter of disk, others measuring some 45–55 mm. in diameter. In these large specimens the radial ribs are generally very conspicuous, though dependent to some degree on the preservation, specimens with the disk somewhat swollen having them much less conspicuous than those with the disk flattened. The latter case particularly holds good of the largest specimen (Plate V, fig. 2), which, indeed, gives much the impression of being senescent. The arms in these large specimens are very powerful, some 11 mm. wide, 13 mm. high, and have a very snake-like appearance. About the length of the arms in these large specimens it is not possible to give any definite statements, because the arms are very much coiled up and in most cases broken. But in a specimen 22 mm. in diameter of disk with the arms uncoiled I find the arm length to be no less than *ca.* 400 mm. This does not necessarily imply that in the larger specimens the arms are correspondingly longer, for in a specimen of *ca.* 25 mm. diameter the arms do not much exceed 300 mm. in length. (Koehler states that the arms of his specimen of 36 mm. diameter of disk were more than 320 mm. in length; evidently they were broken, so that it is unknown by how much they exceeded that length.) It would appear that there is considerable variation in the length of the arms, though not in the arms of the same specimen, such as is characteristic of *Asteronyx.*

In specimens with the disk flattened there is generally a sharp edge along the interradii, recalling the belt of marginal plates of *Gorgonocephalus*. There are, however, no conspicuous marginal plates; on removing the grain-covering one finds the scales here not much larger than the scales underlying the granules of the disk; it is mainly the folding of the skin that produces this sharp edge.

The primary plates of the disk are usually distinct in the young specimens, as represented by Koehler (*op. cit.*, 1908, pl. xiii, fig. 120); but herein there is a good deal of individual variation.

I have opened a couple of specimens in order to see what they feed on. Remnants of Crustaceans, Copepods and what was probably a Hyperiid were found and in one specimen there was a rather large lump of jelly of uncertain origin. It appears that the species feeds on plankton organisms, which it most probably catches with the slender distal part of its arms. The eggs are small and numerous, indicating perhaps a free-swimming larval stage.

Astrochlamys bruneus, Koehler

(Plate VII, fig. 8)

Astrochlamys bruneus, Koehler, 1912. II^e^ Expéd. Antarct. Française. Echinodermes, p. 143, pl. xi, figs. 3, 4, 6, 7, 14, 15.

A. bruneus, Koehler, 1923. Swedish Antarct. Exped. Astéries et Ophiures, p. 103.

A. bruneus, Döderlein, 1930. Deutsche Tiefsee-Exped. Ophiuriden. II, Euryalae, p. 373, Taf. i, figs. 3–5 (p. 356, fig. 1 *e*; p. 363, fig. 14 *l*, *m*).

St. 39. 25. iii. 26. West Cumberland Bay, South Georgia, 179–235 m. 4 specimens.

St. 123. 15. xii. 26. Off mouth of Cumberland Bay, South Georgia, 230–250 m. 2 specimens.

St. 140. 23. xii. 26. Stromness Harbour to Larsen Point, South Georgia, 122–136 m. 3 specimens.

St. 144. 5. i. 27. Off mouth of Stromness Harbour, South Georgia, 155–178 m. 4 specimens.

St. 148. 9. i. 27. Off Cape Saunders, South Georgia, 132–148 m. 1 specimen.

St. 170. 23. ii. 27. Off Cape Bowles, Clarence Island, 342 m. 1 specimen.

Most of the larger specimens of this species are carrying a smaller one on their back (Plate VII, fig. 8), a fact naturally leading to the suggestion that this is a sort of copulation, the larger specimen being the female, the smaller the male. And so it actually is, as proved by the examination of the gonads of these specimens. It was possible also to demonstrate that the species is viviparous. The two first specimens opened had their bursae entirely empty; the third had them packed with eggs, which seemed, however, to be only just fertilized. But the fourth specimen opened settled the question, for it had the bursae filled with embryos, all in the same stage of development. The embryos

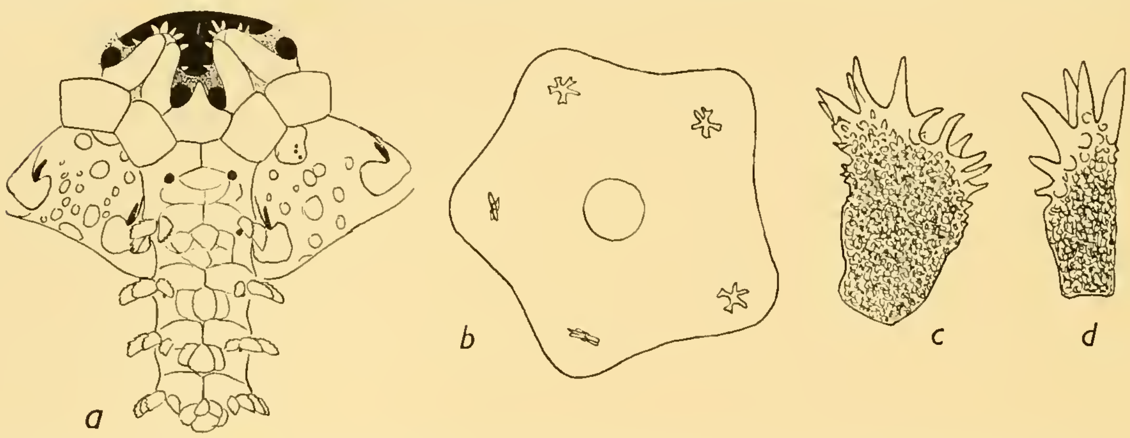


Fig. 2 *a–c*. *Astrochlamys bruneus*, Koehler. *a*, Part of oral side, ×8. *b*, Embryo, showing the five terminal plates, and in the centre the mouth, ×80. *c*, Arm spine, ×45.

Fig. 2 *d*. Arm spine of *Astrochlamys sol*, n.sp., ×45.

were small and star-shaped, with an indication of a mouth invagination and the first indication of the skeleton, viz. the terminal plate; but as yet there was no trace of the ambulacral skeleton or of any other plates (Fig. 2 *b*). There were some 200 embryos in each bursa, which means that they cannot reach any large size before they leave the mother—in conformity with the small size of the genital slits. The eggs are shed (into the bursae) all at a time, and this appears to be likewise the case with the sperms, none of the males being found to contain ripe sperms in their gonads. This is again in conformity with the fact that some of the larger specimens carry no male on their back, so that copulation is not going on constantly, as is the case in *Amphilycus androphorus*, Mortensen, and, to a less degree apparently in *Ophiosphaera insignis*, Brock, and *Ophiodaphne materna*, Koehler (cf. Mortensen, *Biological observations on Ophiurids*. Papers from Dr Th. Mortensen's Pacific Exped., LXIII (Vid. Medd. Dansk Naturh. Foren., 93), 1933, pp. 178–88). In these three Ophiurids the male is carried over the mouth of

the female. *Astrochlamys bruneus* is the first Ophiurid known to carry the male on the back, as it is also the first viviparous Gorgonocephalid made known.

The largest specimen at hand measures 20 mm. in diameter of disk, the arms being *ca.* 100 mm. long. I give here a sketch of the oral side of this species (fig. 2 *a*) in order to show the shape of the plates, which is not seen distinctly in either Koehler's or Döderlein's figures. Koehler states that the two first pairs of pores are without papillae, and his pl. xi, fig. 6 (*op. cit.*, 1912) shows it distinctly. Döderlein (*op. cit.*) states that only the first pore pair is without papillae, and this is clearly indicated in his figure (Taf. i, fig. 4). The apparent contradiction is due to the fact that the first pair of pores in Koehler's figure are the outer mouth pores. But these are covered over by a thick skin which closes up the distal half of the mouth slits. Only when this skin is dissolved do these pores become distinct. An indication of this skin covering the mouth slit is seen on the right side, the upper arm, in Döderlein's Taf. i, fig. 4.

Astrochlamys sol, n.sp.

(Plate VII, fig. 9)

St. 170. 23. ii. 27. Off Cape Bowles, Clarence Island, 342 m. 1 specimen, attached to a coral-like Bryozoan.

Diameter of disk *ca.* 13 mm., length of arms *ca.* 50 mm. Arms 10.

In its general characters this species closely resembles *A. bruneus.* Mouth papillae not distinct, being covered by the thick skin that invests the whole animal. First pair of arm pores apparently rudimentary. As in *A. bruneus* there are one or two spines (papillae) at the second pore pair, three at the third pair, and thereafter four spines. These latter are slightly different from those of *A. bruneus*, having fewer thorns (Figs. 2 *c–d*). The hooks are alike in both; the hook belts are interrupted in the dorsal median line in the proximal part of the arms. In regard to the plates of the oral region it appears that the buccal plates are somewhat better developed than in *A. bruneus.* Ventral plates of arms irregularly divided as in *bruneus.*

Not thinking it desirable to remove the specimen from the Bryozoan to which it clings, or to spoil it too much by cleaning off the skin, I cannot give any detailed figures. But the species is so markedly different from the five-armed *A. bruneus* by reason of its numerous arms that the characters here given should suffice for recognizing it with certainty.

Astrohamma tuberculatum (Koehler)

Astrothamnus tuberculatus, Koehler, 1923. Swedish Antarct. Exped. Astéries et Ophiures., p. 133, figs. 1 *a–f*.
Astrotoma tuberculatum, Döderlein, 1927. Indopacifische Euryalae, p. 21.
Astrohamma tuberculatum, Döderlein, 1930. Deutsche Tiefsee-Exped. Ophiuriden. II, Euryalae, p. 372, Taf. i, fig. 2 (p. 363, fig. 14 *n*).

St. 190. 24. iii. 1927. Bismarck Strait, Palmer Archipelago. 315 m. 2 specimens.

These specimens are 15–16 mm. in diameter of disk, thus somewhat larger than those hitherto recorded (8–10·5 mm.). They conform perfectly to the descriptions given by Koehler and Döderlein and do not call for further remarks.

Gorgonocephalus chilensis (Philippi)

Gorgonocephalus chilensis, Döderlein, 1911. Japanische und andere Euryalae, pp. 30, 105, Taf. v, fig. 5; viii, figs. 1, 1 *a*.

G. chilensis, H. L. Clark, 1915. Cat. Recent Ophiurans, p. 185.

G. chilensis, Koehler, 1923. Swedish Antarct. Exped. Astéries et Ophiures, p. 101, pl. xiv, fig. 1.

G. chilensis, Döderlein, 1927. Indopacifische Euryalae, pp. 30, 92.

G. chilensis, Zirpolo, 1932. *Sul* Gorgonocephalus chilensis, *Lyman*. Ann. Mus. Zool. Univ. Napoli, VI, 7, pp. 1–16.

Non: Gorgonocephalus chilensis, H. L. Clark, 1923. Echinoderm Fauna South Africa, p. 318 (= *Gorgonocephalus pectinatus*, Mortensen).

For the older literature I may refer to Döderlein's work of 1911 (*loc. cit.*).

St. 51. 4. v. 26. Off Eddystone Rock, East Falkland Islands, 105–115 m. 1 large specimen.

St. 158. 21. i. 27. 53° 48′ S, 35° 57′ W, South Georgia, 401–411 m. 2 specimens, one large, *ca.* 70 mm. diameter of disk, one small, 20 mm. diameter.

St. 160. 7. ii. 27. Off Shag Rocks, South Georgia, 177 m. 1 young specimen, 9 mm. diameter of disk.

St. 181. 12. iii. 27. Schollaert Channel, Palmer Archipelago, 160–335 m. 3 specimens.

St. 576. 17. iv. 31. Falkland Islands, 34–24 m. 2 large specimens.

St. WS 72. 5. iii. 27. 51° 07′ S, 57° 34′ W, Falkland Islands, 79 m. 1 specimen, *ca.* 65 mm. diameter of disk.

St. WS 73. 6. iii. 27. 51° 01′ S, 58° 54′ W, Falkland Islands, 121 m. 2 specimens.

St. WS 76. 11. iii. 27. 51° 00′ S, 62° 02′ W, Falkland Islands, 207–205 m. 3 specimens.

St. WS 80. 14. iii. 27. 50° 57′ S, 63° 37′ W, Falkland Islands, 152–156 m. 2 specimens, young, 8 and 15 mm. diameter of disk.

St. WS 829. 31. i. 32. 50° 51′ S, 63° 13′ W, Falkland Islands, 155 m. 4 specimens.

This species was not hitherto known to occur as far south as South Georgia and the Palmer Archipelago. The larger of the specimens from South Georgia has almost naked radial ribs, but does not otherwise differ from typical *G. chilensis*; in the smaller specimen, on the other hand, the radial ribs are rather unusually strongly spiny. On the whole, there is much variation in the development of "stumps" on the disk. In the young specimens of *G. chilensis* the disk is densely covered by a uniform granulation, which is, again, remarkably coarse in the specimen from the Shag Rocks Bank. On the largest of the specimens from St. WS 829 a couple of young ones, 3 mm. in diameter of disk, were found attached. Already at this size the disk is covered by rounded granules, none of the primary plates remaining distinct.

In the young specimens the hooks are already present at the base of the arms, but only on the sides, not forming complete belts till beyond the second forking, and in the adult specimens still farther out.

The larger specimen from St. 158 is stated in a note to be thus coloured: "Disk whitish, arms salmon-pink, deepest at tips."

Two specimens were opened in order to see whether they might be infested with *Protomyzostoma*; nothing of the kind was found. The eggs are small and the gonads exceedingly numerous, much as in *Gorgonocephalus eucnemis*, etc.; the presence of young ones on one of the specimens is thus, as in other species, a casual attachment of the

young on an adult—not necessarily its parent—and not a case of viviparity or brood-protection.

That the specimens from South Africa referred to *G. chilensis* have nothing to do with this South American species, but represent a distinct species, *G. pectinatus*, Mortensen, I showed in my paper on the Echinoderms of South Africa (Papers from Dr Th. Mortensen's Pacific Exped., LXV (Vid. Medd. Dansk Naturh. Foren., 93), 1933, p. 283).

As for the specimens from Kerguelen and New Zealand, likewise referred to *G. chilensis*, I must reserve opinion until the examination of new and sufficient material allows a definite judgment. The zoogeography of other sub-Antarctic Echinoderms is not in favour of these specimens being identical with the South American *G. chilensis*.

Family TRICHASTERIDAE

Astroceras elegans (Bell)

Astroschema elegans, Bell, 1917. Brit. Antarct. ('Terra Nova') Exped. Echinoderma, p. 7.

Astroceras elegans, Mortensen, 1924. *Echinoderms of New Zealand and the Auckland-Campbell Islands.* II, *Ophiuroidea.* Papers from Dr Th. Mortensen's Pacific Exped., XX (Vid. Medd. Dansk Naturh. Foren., 77), p. 107, pl. iv, fig. 3.

A. elegans, Mortensen, 1933. *Studies of Indo-Pacific Euryalids.* Vid. Medd. Dansk Naturh. Foren., 96, p. 53.

St. 934. 17. viii. 32. 34° 11′ S, 172° 10′ E, north of New Zealand, 92–98 m. 2 specimens.

These specimens differ from those hitherto known in the arms being of a uniform light brown colour (apart from the white tubercles), not an annulated appearance due to alternating rings of white and brown skin. I do not think this colour difference to be any serious objection to referring them to the species characteristic of the area off the north end of New Zealand, *A. elegans*.

Family OPHIOMYXIDAE

Ophiomyxa vivipara, Studer

Ophiomyxa vivipara, Studer, 1876. *Über Echinod. a. d. antarkt. Meere.* Monatsber. Akad. Berlin, p. 462.

Ophioscolex Coppingeri, Bell, 1881. *Echinod. Straits of Magellan and coast of Patagonia.* Proc. Zool. Soc. Lond., 1881, p. 98, pl. viii, fig. 6.

Ophiomyxa vivipara, Ludwig, 1898. *Ophiuren d. Sammlung Plate.* Zool. Jahrb., Suppl. IV, p. 768.

O. vivipara, H. L. Clark, 1915. Cat. Recent Ophiurans, p. 170, pl. 2, figs. 1–2.

O. vivipara, Mortensen, 1920. *On Hermaphroditism in viviparous Ophiurids.* Acta Zoologica, I, p. 10.

O. vivipara, H. L. Clark, 1923. *Echinoderm Fauna of South Africa.* Ann. S. African Mus., XIII, p. 313.

O. vivipara, Mortensen, 1933. *Echinoderms of South Africa.* Papers from Dr Th. Mortensen's Pacific Exped., LXV (Vid. Medd. Dansk Naturh. Foren., 93), p. 301.

St. 6. 1. ii. 25. Tristan da Cunha, 80–140 m. 1 specimen.
St. 388. 16. iv. 30. 56° 19′ S, 67° 10′ W, 121 m. 1 specimen.
St. WS 73. 6. iii. 27. 51° 01′ S, 58° 54′ W, Falkland Islands, 121–130 m. 2 specimens.
St. WS 80. 14. iii. 27. 50° 57′ S, 63° 37′ W, Falkland Islands, 152–156 m. 1 specimen.
St. WS 81. 19. iii. 27. 8 miles N 11° W of North Islands, West Falkland Islands, 81–82 m. 10 specimens.
St. WS 84. 24. iii. 27. 7·5 miles S 9° W of Sea Lion Island, East Falkland Islands, 75–74 m. 8 specimens.
St. WS 85. 25. iii. 27. 8 miles S 66° E of Lively Island, East Falkland Islands, 79 m. 2 specimens.
St. WS 88. 3. iv. 27. 54° 00′ S, 64° 57′ W, 118 m. 2 specimens.
St. WS 93. 9. iv. 27. 7 miles S 80° W of Beaver Island, West Falkland Islands, 133–130 m. 4 specimens.
St. WS 243. 17. vii. 28. 52° 00′ S, 64° 30′ W, West Falkland Islands, 144–141 m. 3 specimens.
St. WS 776. 3. xi. 31. 46° 18′ S, 65° 02′ W, 107–99 m. 1 specimen.
St. WS 804. 6. i. 32. 50° 21′ S, 62° 53′ W, 143–150 m. 1 specimen.
St. WS 823. 19. i. 32. 52° 14′ S, 60° 01′ W, 80–95 m. 1 specimen.
St. WS 824. 19. i. 32. 52° 29′ S, 58° 27′ W, 146–137 m. 10 specimens.
St. WS 825. 19. i. 32. 50° 50′ S, 57° 15′ W, 135–144 m. 1 specimen.
St. WS 848. 10. ii. 32. 50° 37′ S, 66° 24′ W, 115–117 m. 1 specimen.

In my paper on the South African Echinoderms (*op. cit.*, 1933, p. 302) I remarked that the only difference I could find between the South African and the South American form of this species was that in the South African form there is only one spine at the proximal five or six pore pairs, whereas in the Magellanic form there are two spines already at the third or fourth pore pair. The specimens in the present collection all have two spines from the third or fourth pore pair, which seems to indicate that this difference is reliable, so that it may be possible to distinguish the South African form as a separate variety, var. capensis, n.var.

The specimen from off Tristan da Cunha, a locality from which the species had not hitherto been recorded, agrees with the typical South American form in regard to the numbers of spines at the proximal pore pairs.

Ludwig (*op. cit.*) proved that *Ophioscolex Coppingeri* of Bell was identical with *Ophiomyxa vivipara*. Having seen the type-specimen of Bell's species in the British Museum, I can confirm the result reached by Ludwig.

Ophiomyxa brevirima, H. L. Clark

Ophiomyxa brevirima, H. L. Clark, 1915. Cat. Recent Ophiurans, p. 169, pl. i, figs. 3–4.
O. brevirima, Mortensen, 1924. *Echinoderms of New Zealand and the Auckland-Campbell Islands.* II, *Ophiuroidea*. Papers from Dr Th. Mortensen's Pacific Exped., xx (Vid. Medd. Dansk Naturh. Foren., 77), p. 110.

St. 941. 20. viii. 32. 40° 51′ S, 174° 48′ E, Cook Strait, 128 m. 4 specimens.

Referring to the observation recorded in my paper on the New Zealand Ophiurids (p. 113) that two types of breeding occur among the specimens identified as *O. brevirima*, viz. one having the bursae filled up with a great number of small embryos, the other having only one young in each bursa (a difference tending to indicate that the two types in reality represent two distinct species), it should be mentioned that the present

specimens belong to the type with numerous small embryos in the bursae. The specimens, which are not very well preserved, show an indication of dark bands on the arms; otherwise they are white.

Ophioscolex (Ophiolycus) nutrix, n.sp.

(Plate VII, fig. 6.)

St. 159. 21. i. 27. 53° 52′ S, 36° 08′ W, South Georgia, 160 m. 2 specimens.
St. 160. 7. ii. 27. 53° 43′ S, 40° 57′ W, near Shag Rocks, South Georgia, 177 m. 1 specimen.
St. WS 42. 7. i. 27. 54° 42′ S, 36° 47′ W, South Georgia, 198 m. 2 specimens.
St. WS 86. 3. iv. 27. 53° 53′ S, 60° 34′ W, Falkland Islands, 151–147 m. 1 specimen.
St. WS 225. 9. iv. 28. 50° 20′ S, 62° 30′ W, Falkland Islands, 162 m. 1 specimen.
St. WS 228. 30. vi. 28. 50° 50′ S, 56° 58′ W, Falkland Islands, 229–236 m. 4 specimens.
St. WS 824. 19. i. 32. 52° 29′ S, 58° 27′ W, Falkland Islands, 146–137 m. 2 specimens.
St. WS 839. 5. ii. 32. 53° 30′ S, 63° 29′ W, Falkland Islands, 403–434 m. 1 specimen.

Diameter of disk up to *ca.* 10 mm., length of arms about three to four times the diameter of disk. Both aboral and oral sides of disk with a varying number of small spines, protruding through the thick investing skin; in the specimen figured in Plate VII, fig. 6, they are exceptionally numerous. Radial shields small, but fairly distinct, oval, widely separated—but in some specimens no trace of radial shields is seen.

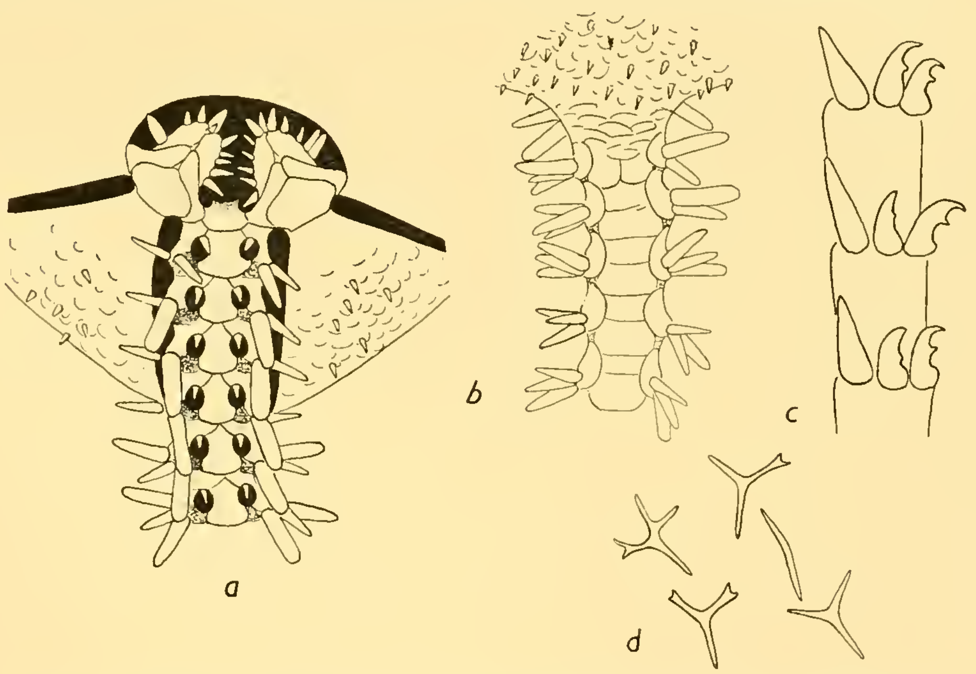


Fig. 3. *Ophioscolex nutrix*, n.sp. *a*, Part of oral side. *b*, Part of dorsal side, ×8. *c*, Side view of distal arm joints, showing the two upper spines transformed into hooks, ×30. *d*, Spicules from stomach wall, ×45.

Mouth papillae rather irregular and varying in number; generally the distalmost one or two are somewhat enlarged. Buccal shields conspicuously broader than long, with an obtuse angle within and a straight outer edge. Adoral shields joining within. Ventral plates contiguous in the proximal part of arm, separated beyond the disk; the distal

edge is gently convex. The pores have a well-developed tentacle scale (Fig. 3 *a*). Dorsal arm plates in the basal part of arms fairly regularly divided into two parts (Fig. 3 *b*). Arm spines two on the joints within the disk; beyond the disk there are three spines. In the proximal part of the arms the lowermost and the uppermost spine enlarged, somewhat flattened and sometimes a little curved. In the distal part the two uppermost spines transformed into hooks (Fig. 3 *c*). The scales of the disk as usual with a glassy, concentrically striated margin. Rather large mainly three-radiate spicules in the stomach wall (Fig. 3 *d*). About the colour in life there is no information; the preserved specimens are white.

It is evident that this species is nearly related to the South African *O. dentatus*, Lyman, and it might, indeed, seem questionable whether the small differences to be observed (cf. fig. 3 with the figures of *O. dentatus* given in my paper on the South African Echinoderms, pp. 310–11, figs. 32–4) are really of sufficient value for specific distinction. Of this there cannot, however, be the slightest doubt, for I find that the South American form is *viviparous* and—partly—*hermaphrodite*, whereas *O. dentatus*, as well as the closely related *O. purpureus*, are not viviparous and have separate sexes. Thus it is certain that the South American form is a quite distinct species, the more interesting as this is the first viviparous species of the genus *Ophioscolex* to be known.

The statement that this species is "partly" hermaphrodite means that some specimens are not hermaphrodite, but purely males or females. Thus the species is a *facultative hermaphrodite*. This is of interest in connection with the fact that the two known viviparous species of *Ophiomyxa* have separate sexes. It would seem to be a beginning of hermaphroditism that we are witnessing in this primitive Ophiurid, hermaphroditism in Ophiurids being apparently a specialization acquired in connection with viviparity.

As regards the arrangement of the gonads in the hermaphrodite specimens it seems to be the more usual condition that the male gonads are situated at the adradial side, the female gonads along the interradial side of the bursae, but there is no regularity either in the arrangement or the number of the gonads. I have found only one or two young ones at a time in the bursae.

No species of *Ophioscolex* was known till now from the Antarctic or sub-Antarctic region, the "*Ophioscolex Coppingeri*" of Bell being nothing but *Ophiomyxa vivipara* (cf. above, p. 242). It is thus a rather surprising fact that no less than two species of the genus, *Ophioscolex nutrix* and the following species, *O. marionis*, have been discovered by the ships of the Discovery Committee in the sub-Antarctic region.

Ophioscolex marionis, n.sp.

St. 1563. 7. iv. 35. 46° 48′ S, 37° 49′ E, off Marion Island, 113–99 m. 1 specimen.

Diameter of disk 5·5 mm. Arms all broken close to the disk; they are 1·5 mm. broad, somewhat flattened. Disk covered by thick skin, through which some scattered short spines protrude all over the dorsal side, a single one also here and there on the ventral interradii. Apparently no radial shields. The buccal shields are small, rounded tri-

angular, adoral shields rather broad, not joining within; they separate broadly the buccal shield from the first lateral plate. Mouth papillae small, feebly developed. Ventral arm plates distinctly longer than broad, with convex distal edge, joining broadly at least as far out on the arms as they are preserved. Dorsal arm plates very feebly developed, as usual, but covering the whole broad dorsal side between the small lateral plates; they are not divided in two by a transverse line. Arm spines four, short, robust, the lowermost and uppermost ones slightly longer than the two middle ones. One tentacle scale. Colour in alcohol brownish.

The species is clearly *viviparous*; not that I have actually found embryos within it, but the eggs are large, *ca.* 0·2–0·3 mm. and yolky, seven to ten eggs in each gonad; and then it is *hermaphrodite*, there being one male gonad at the adradial side and one or two female gonads at the interradial side of the bursa. As not a single case is known

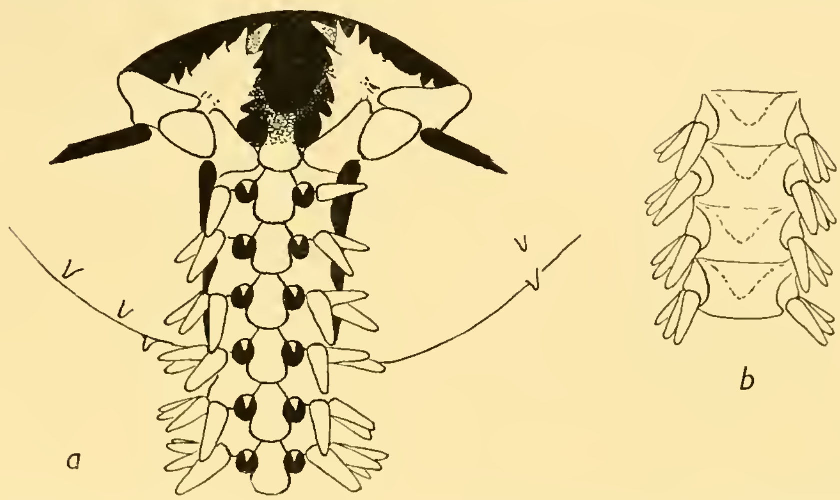


Fig. 4. *Ophioscolex marionis*, n.sp. *a*, Part of oral side. *b*, Part of dorsal side of arm. The dotted arch-lines represent the outline of the vertebrae seen through the exceedingly thin dorsal plates. ×15.

of a non-viviparous Ophiurid being hermaphrodite, we may, I think, safely conclude that this species must be viviparous, as the character of the female gonads also indicates.

It may be added that no spicules are found in the stomach wall, such as occur in *O. nutrix*.

That this species is not very closely related to the other Antarctic species of *Ophioscolex*, *O. nutrix*, is evident enough; a comparison of the figures will show the differences in the shape of the buccal shield, ventral and dorsal arm plates, and the mouth papillae, to which may be added the difference in the number of arm spines, one having three, the other four spines, which makes an important difference within this genus. It would appear that the present species is the nearest related to *O. quadrispinus*, Verrill, from off Nova Scotia; this species is, however, scarcely sufficiently well known to allow the differences between the two species to be indicated; but it seems that *O. quadrispinus* has no spines on the disk.

It is very regrettable that the arms of the single specimen of *O. marionis* are all broken, so that it cannot be seen whether the upper spines are transformed into hooks in the distal part of the arms, as they are in *O. dentatus-purpureus* and *O. nutrix*, a character which has an important bearing on the question of the validity of the subgenus or genus *Ophiolycus* (cf. my paper on the Echinoderms of South Africa, p. 315). If these spines are not transformed into hooks in *O. marionis* this species will form a connecting link between *Ophiolycus* and the typical *Ophioscolex*.

Family OPHIACANTHIDAE

Ophiacantha vivipara, Ljungman

(Plate VII, fig. 2)

Ophiacantha vivipara, Ljungman, 1870. *On tvänne nya arter Ophiurider.* Öfvers. Vet. Akad. Handl., 1870, p. 470.

Ophiocoma (?) *vivipara*, Wyv. Thomson, 1877. The Atlantic, II, pp. 241–4, fig. 50.

Ophiacantha vivipara, Ludwig, 1899. Ophiuroideen Hamburger Magalh. Sammelreise, p. 13.

O. vivipara, Koehler, 1912. IIᵉ Expéd. Antarct. Française. Echinodermes, p. 138, pl. xi, figs. 1–2, 10.

O. vivipara, Koehler, 1917. *Echinodermes de Kerguelen.* Ann. Inst. Oceanogr., VII, 8, p. 71.

O. vivipara, Mortensen, 1920. *On Hermaphroditism in viviparous Ophiurids.* Acta Zoologica, I, p. 10.

O. vivipara, Koehler, 1923. Swedish Antarct. Exped. Astéries et Ophiures, p. 105.

O. vivipara, G. A. Smith, 1923. *Report on the Echinoderms coll. during the voyage of the 'Quest'.* Ann. Mag. Nat. Hist., 9 Ser., XII, p. 368.

O. vivipara heptactis, Hertz. 1926. Deutsche Südpolar-Exped. Ophiuroiden, p. 36.

O. vivipara, Koehler, 1927. Austral. Antarct. Exped. Echinod. Ophiuroidea, p. 12.

O. vivipara, Grieg, 1929. *Some Echinoderms from the South Shetlands.* Bergens Mus. Årbok, 1929, 3, p. 7.

For references to the older literature I may refer to Ludwig, *op. cit.*

St. 27. 15. iii. 26. West Cumberland Bay, South Georgia, 110 m. Several specimens.
St. 39. 25. iii. 26. East Cumberland Bay, South Georgia, 179–235 m. 4 specimens.
St. 42. 1. iv. 26. Off mouth of Cumberland Bay, South Georgia, 120–204 m. Several specimens.
St. 123. 15. xii. 26. Off mouth of Cumberland Bay, South Georgia, 230–250 m. 2 specimens.
St. 140. 23. xii. 26. Stromness Harbour to Larsen Point, South Georgia, 122–136 m. *ca.* 15 young specimens.
St. 144. 5. i. 27. Off mouth of Stromness Harbour, South Georgia, 155–178 m. 4 specimens.
St. 148. 9. i. 27. Off Cape Saunders, South Georgia, 132–148 m. 1 young specimen.
St. 156. 20. i. 27. 53° 51′ S, 36° 21′ W, South Georgia, 200–236 m. 2 specimens.
St. 159. 21. i. 27. 53° 52′ S, 38° 08′ W, South Georgia, 160 m. 1 specimen.
St. 160. 7. ii. 27. Near Shag Rocks, South Georgia. 177 m. 5 specimens.
St. 170. 23. ii. 27. Off Cape Bowles, Clarence Island, 342 m. 10 specimens.
St. 175. 2. iii. 27. Bransfield Strait, South Shetlands, 200 m. 2 specimens.
St. 190. 24. iii. 27. Bismarck Strait, Palmer Archipelago, 93–130 m. 3 specimens.
St. 474. 12. xi. 30. Off Shag Rocks, South Georgia, 199 m. 12 specimens.
St. 599. 17. i. 31. 67° 08′ S, 69° 06′ W, 203 m. 1 specimen.
St. 652. 14. iii. 31. Burdwood Bank. 171–169 m. 1 specimen.
St. 1562. 7. iv. 35. 46° 53′ S, 37° 55′ E, off Marion Island, 90–97 m. 4 specimens.
St. 1563. 7. iv. 35. 46° 48′ S, 37° 39′ E, off Marion Island, 113–99 m. 6 specimens.

St. 1564. 7. iv. 35. 46° 36′ S, 38° 02′ E, off Marion Island, 108–113 m. Several specimens.
St. WS 27. 19. xii. 26. 53° 55′ S, 38° 01′ W, South Georgia, 106 m. 10 specimens.
St. WS 33. 21. xii. 26. 54° 59′ S, 35° 24′ W, South Georgia, 130 m. *ca.* 20 specimens.
St. WS 42. 7. i. 27. 54° 42′ S, 36° 47′ W, South Georgia, 198 m. 2 specimens.
St. WS 73. 6. iii. 27. 51° 01′ S, 58° 54′ W, Falkland Islands, 121 m. 3 specimens.
St. WS 80. 14. iii. 27. 50° 57′ S, 63° 37′ W, Falkland Islands, 152–156 m. 2 specimens.
St. WS 81. 19. iii. 27. 8 miles N 11° W of North Island, West Falkland Islands, 81–82 m. 5 specimens.
St. WS 84. 24. iii. 27. 7½ miles S 9° W of Sea Lion Island, East Falkland Islands, 75–74 m. Several specimens.
St. WS 85. 25. iii. 27. 8 miles S 66° E of Lively Island, East Falkland Islands, 79 m. 15 specimens.
St. WS 88. 6. iv. 27. 54° 00′ S, 64° 57′ W, 118 m. 8 specimens.
St. WS 91. 8. iv. 27. 52° 54′ S, 64° 37′ W, 191–205 m. 1 specimen.
St. WS 92. 8. iv. 27. 51° 58′ S, 65° 01′ W, 145–143 m. Several specimens.
St. WS 93. 9. iv. 27. 7 miles 80° W of Beaver Island, West Falkland Islands, 133–130 m. 5 specimens.
St. WS 233. 5. vii. 28. 49° 25′ S, 59° 45′ W, 185–175 m. 5 specimens.
St. WS 234. 5. vii. 28. 48° 52′ S, 60° 25′ W, 195–207 m. Several specimens.
St. WS 248. 20. vii. 28. 52° 40′ S, 58° 30′ W, Falkland Islands, 210–242 m. Several specimens.
St. WS 750. 19. ix. 31. 52° 12′ S, 67° 19′ W, 95 m. 2 specimens.
St. WS 755. 21. ix. 31. 51° 39′ S, 57° 39′ W, 77 m. 8 specimens.
St. WS 773. 31. x. 31. 47° 28′ S, 60° 51′ W, 291–296 m. 1 specimen.
St. WS 800. 22. xii. 31. 48° 16′ S, 62° 10′ W, 139–137 m. 5 specimens.
St. WS 804. 6. i. 32. 50° 21′ S, 62° 53′ W, 143–150 m. 7 specimens.
St. WS 815. 13. i. 32. 51° 52′ S, 65° 44′ W, 132–162 m. 1 specimen.
St. WS 816. 14. i. 32. 52° 10′ S, 64° 56′ W, 150 m. 2 specimens.
St. WS 817. 14. i. 32. 52° 23′ S, 64° 19′ W, 191–202 m. 14 specimens.
St. WS 824. 19. i. 32. 52° 29′ S, 58° 27′ W, 146–137 m. Several specimens.
St. WS 825. 29. i. 32. 50° 50′ S, 57° 15′ W, 135–144 m. *ca.* 15 specimens.
St. WS 840. 6. ii. 32. 53° 52′ S, 61° 49′ W, 368–463 m. 15 specimens.
St. WS 869. 31. iii. 32. 52° 15′ S, 64° 14′ W, 187 (–0) m. Several specimens.
St. MS 14. 17. ii. 25. East Cumberland Bay, South Georgia, 109–180 m. 6 specimens.
St. MS 71. 9. iii. 25. East Cumberland Bay, South Georgia, 110–60 m. Several specimens.

In my paper, *On Hermaphroditism in viviparous Ophiurids*, I have stated (p. 10) that this species appears to be a protandric hermaphrodite, the old and poorly preserved material then at my disposal making this statement, however, somewhat uncertain. On a renewed examination of the rich material now at hand I find that it is not protandric.

Specimens of 5–6 mm. diameter already show gonads of distinctly female character. I think that in one case I have discerned a male gonad in a specimen of 6 mm. diameter of disk, together with distinct female gonads. But otherwise I have found only female gonads in all the numerous specimens of various sizes, from 5 to 18 mm. diameter of disk. (Among the specimens of var. *pentactis* male specimens are quite common.) This is quite a perplexing case; one is, indeed, tempted to suggest that the species is usually parthenogenetic. I have re-examined some preparations on which the statements in my paper of 1920 about the hermaphroditism of this species are (partly) based, and find that there is, at least, one clearly hermaphrodite gonad from a specimen of 9·5 mm. dia-

meter, whereas the gonads of a specimen of 8·5 mm. diameter appear to be all female. A gonad from a specimen of 14 mm. diameter is purely male. The indications thus are that this species is a proterogynic hermaphrodite.

It may be mentioned that there is only one young one, more rarely two, at a time in the bursae, and rarely in more than two to three bursae at a time, in conformity with the fact that rarely more than three to four young ones are found attached to the females.

In some cases I found gonads only along the adradial side of the bursae.

Some of the specimens from South Georgia are infested by a parasitic organism, probably referable to the Copepod genus *Ophioika*, described by K. Stephensen from an *Ophiacantha* from the Bali Sea (*Some new Copepods, parasites of Ophiurids and Echinids*. Papers from Dr Th. Mortensen's Pacific Exped., LXIV (Vid. Medd. Dansk Naturh. Foren., 93), 1933, p. 205). The parasite does not castrate its host; I have found young ones in the bursae in a specimen infested with the parasite. A couple of specimens from Sts. 170 and 190 are infested by an ectoparasitic Copepod of the genus *Cancerillopsis* (?), attached on the dorsal side of the arms, close to the disk.

M. Hertz (*op. cit.*, 1926) has established a variety *heptactis* for the Kerguelen specimens, founded on the fact that an 8-rayed specimen is carrying a 7-rayed young one, all the specimens on the whole being 7-rayed with the exception of only two 8-rayed specimens. The 7-rayed condition thus appears to be hereditary in the Kerguelen form, which is taken to necessitate a separate subspecies for this form. Evidently, however, Dr Hertz has forgotten that Studer (*Über Echinodermen aus dem antarktischen Meere, ges. a. d. Reise S.M.S. 'Gazelle'*. Monatsber. Akad. Berlin, 1876, p. 460) had already established a variety *kerguelensis* for the Kerguelen form; if this form then deserves to rank as a subspecies (which I rather doubt), its name must be *kerguelensis*, the name *heptactis* of Hertz falling directly into synonymy therewith.

As for the specimens in the present collection 6-rayed and 7-rayed specimens are about equally common. One may find 6-rayed young ones on 7-rayed specimens (whereas the inverse case, 7-rayed young ones on 6-rayed specimens was not observed). Here the number of the arms is decidedly of no classificatory value whatever. As for the 5-rayed specimens, cf. below under the var. *pentactis*.

Ophiacantha vivipara, var. pentactis, n.var.

(Plate VII, figs. 3, 4)

St. 170. 23. ii. 27. Off Cape Bowles, Clarence Island, 342 m. 3 specimens.
St. 187. 18. iii. 27. Neumayr Channel, Palmer Archipelago, 259–354 m. 5 specimens.
St. 190. 24. iii. 27. Bismarck Strait, Palmer Archipelago, 93–130 m. 3 specimens.
St. 599. 17. i. 31. 67° 08′ S, 69° 06′ W, 203 m. 1 specimen.

In his work on the Echinoderms of the IIe Expédition Antarctique Française ('Pourquoi-Pas?') Koehler has figured (pl. xi, 1) a large five-armed specimen under the name of *O. vivipara*; he regards this five-armed form as simply identical with the normally 6–7-rayed *O. vivipara*. Particularly he emphasizes the fact that there are all

possible transitions between the forms with the disk covered by a uniform granulation and those with numerous spines on the disk. Although these 5-armed specimens generally have more numerous spines on the disk besides the granules, there is thus no reason for distinguishing them from the typical 6–7-armed *O. vivipara*; and also in the other characters they agree, on the whole, with the typical *vivipara*. Still the matter is not quite so simple.

It is undeniable that these 5-armed specimens in general have a much more robust appearance than *vivipara* (cf. Plate VII, figs. 2–4); also the arms are longer and more robust. This can hardly be due simply to the fact that they have fewer arms than the typical form. Then it is a very noticeable fact that this large 5-rayed form is not met with among the specimens from the neighbourhood of the Falkland Islands, but only very far south, from the Palmer Archipelago to the Graham Land region. (Koehler's 5-rayed specimens are also all from this southern region.) If it were simply an individual variation of the 6–7-rayed *vivipara*, it would be hard to understand why such forms should not occur equally commonly also in the Falkland region (the single 5-rayed specimen I have seen from there is only a very young one). The typical *vivipara* also occurs in the more southern region, together with the 5-rayed form; but whereas the 5-rayed form is of common occurrence in the south, it apparently does not occur farther north. Further, there are among these large 5-rayed specimens several males, whereas no male specimens were observed among the typical 6–7-rayed specimens. None of the female specimens of the 5-rayed form have young ones in the bursae, so it is quite possible that this form is not viviparous—at least there is no proof that it is viviparous.

Thus, in my opinion, it is not justifiable simply to identify these specimens with the typical 6–7-rayed *O. vivipara*. If it is really *non-viviparous*, it must represent a separate species, but so long as we do not know this for certain, and in view of its resemblance with *vivipara* in general structure, I think it the safest course for the present to designate it as a variety of *O. vivipara*.

From *O. rosea*, with which there is much general resemblance, it is distinguished particularly by the outer mouth papillae being simple, not forming a cluster at the outer mouth tube foot. From *O. densispina* it differs in having both granules and spines on the disk, and in the arm spines being more smooth and not joining in the dorsal median line. Also the shape of the mouth shields is somewhat different (Figs. 5–6).

Ophiacantha densispina, n.sp.

(Plate VII, fig. 1)

St. WS 99. 19. iv. 27. 49° 42′ S, 59° 14′ W, Falkland Islands, 251–255 m. 1 specimen.
St. WS 248. 20. vii. 28. 52° 40′ S, 58° 30′ W, Falkland Islands, 210–242 m. 1 specimen.
St. WS 825. 29. i. 32. 50° 50′ S, 57° 15′ W, Falkland Islands, 135–144 m. 2 specimens.
St. WS 840. 6. ii. 32. 53° 52′ S, 61° 49′ W, Falkland Islands, 368–463 m. 3 specimens.

The type specimen (from St. WS 248) is a large, coarse specimen, 16 mm. in diameter of disk. The arms are all broken, but judging from their size they must have been at least about five to six times the diameter of the disk; they are somewhat flattened,

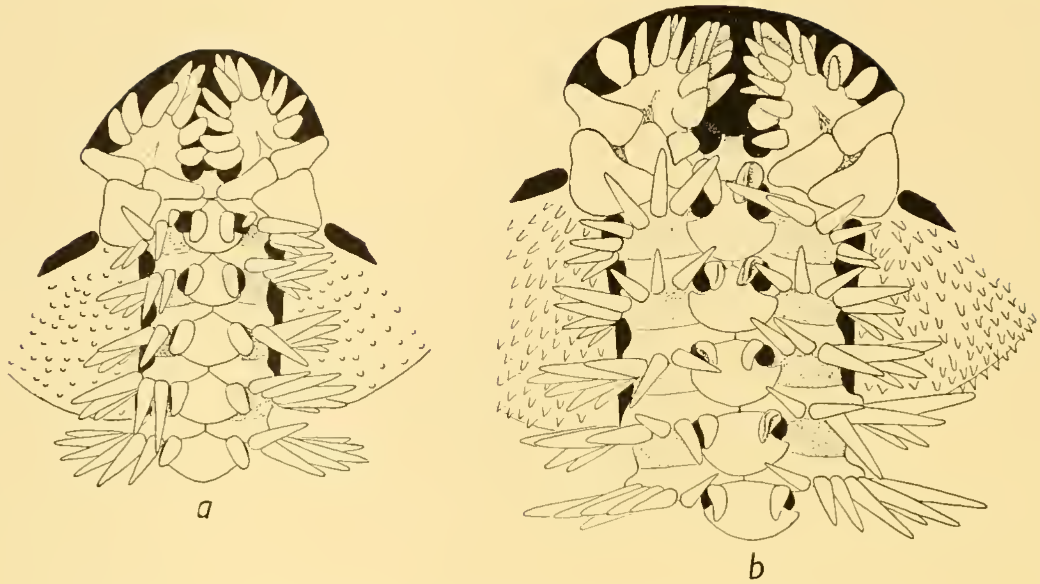


Fig. 5. Part of oral side of *Ophiacantha vivipara*, Ljungman (*a*), and of *O. vivipara*, var. *pentactis*, n.var. (*b*). ×6.

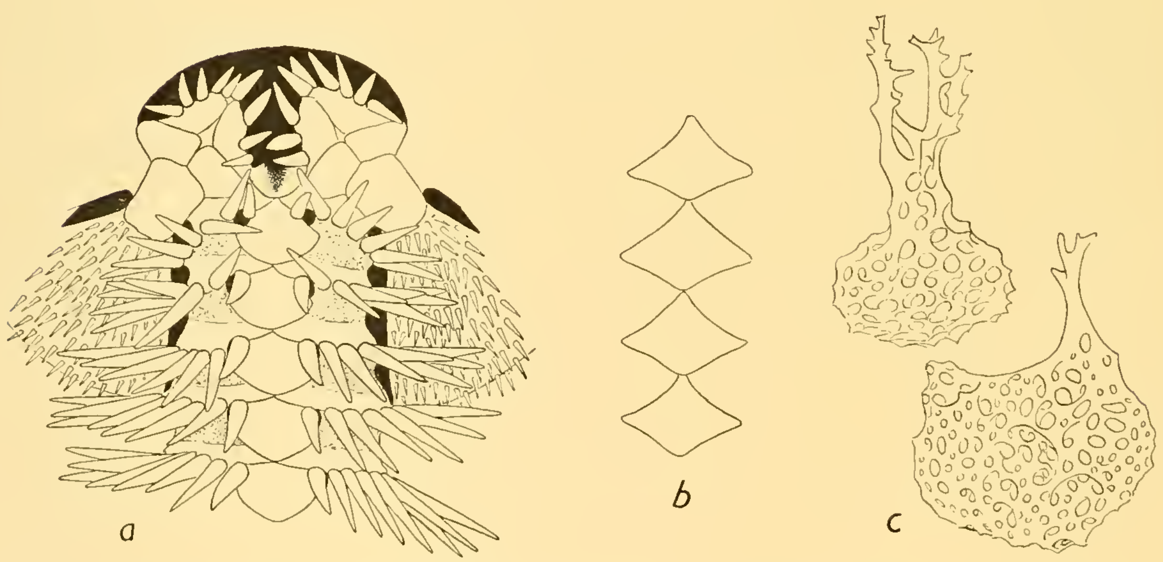


Fig. 6. *Ophiacantha densispina*, n.sp. *a*, Part of oral side, ×6. *b*, Dorsal arm plates, ×8. *c*, Spicules from bursal wall, with prolongations forming spines protruding into the body cavity. ×135.

3·5 mm. broad at the base. The other specimens are smaller and very poorly preserved.

The disk is covered, both on the dorsal and ventral side, by a rather dense coat of coarse spines, 1–1·5 mm. long; they are smooth, simply pointed in the type specimen, in other specimens more blunt. At most the distalmost part of the radial shields is naked, but there may be a rather distinct naked line proceeding inwards in continuation of the radial shields.

There are three to four rather long, slender mouth papillae on each side of the jaw, the outermost not, or only slightly, enlarged, and there are no extra papillae on the distal part of the jaws. The infradental papilla is not at all enlarged, rather smaller than the other papillae, but there are in the type specimen a few small extra papillae placed irregularly at the apex of the jaw. The buccal shields are of a very characteristic shape, almost rectangular, only slightly broader within than without; the adoral plates are small, almost square, sometimes with a more or less conspicuous outward prolongation which separates the buccal shield from the first lateral plate. The ventral plates, which are almost contiguous, have an almost straight proximal edge, the distal edge being convex; they are usually somewhat thickened and elevated in the distal part. A single large, leaf-shaped, more or less pointed tentacle scale. The dorsal plates are almost rhombical, almost contiguous proximally. Arm spines eleven to twelve in the proximal part of the arm, joining in the dorsal median line so as almost to conceal the dorsal plates. They are cylindrical, pointed, rather thorny in the basal part; they increase very gradually in length upwards, the uppermost ones being as long as five to six arm joints. One of the specimens from St. WS 840 is of a dark brown colour, the other specimens whitish, evidently bleached.

This species is *viviparous, but appears to have separate sexes.* The larger specimens (excepting the type and the specimen from St. WS 99, which are dried and could not be examined as to their sexual character) are males; only a small one, 5 mm. in diameter, from St. WS 825, is a female with young ones in the bursae (I found one large and one very small young one in the same bursa).

An interesting anatomical feature is found in this species, viz. that the two bursae at each arm have coalesced above the dorsal side of the arm. They are heavily plated, some of the plates prolonged into irregular spines, turning into the body cavity—to my knowledge a unique feature (Fig. 6 *c*).

There is undeniably much resemblance between this species and *Ophiacantha rosea*, Lyman, taken by the 'Challenger', also off Patagonia (St. 308). It is, however, beyond doubt that they are not identical, the main differences being found in the covering of the disk (small, short stumps of *O. rosea*) and in the mouth papillae, *O. rosea* having a cluster of distal papillae. Further, the bursae are not coalesced in *O. rosea*, as I can state, having examined a cotype of that species. It appears that *O. rosea* is not viviparous.

On examining the specimens of *O. rosea* in the British Museum I found that one from 'Challenger' St. 308 and two specimens from Tom Bay, Patagonia, are infested with *Myzostoma*, particularly at the bursal slits, one being even wholly within the bursa.

Ophiacantha disjuncta (Koehler)

Ophiacantha antarctica, Koehler, 1901. Result. Voyage 'Belgica'. Echinides et Ophiures, p. 34, pl. iv, figs. 23–25. *Non: Ophiacantha antarctica* (Lyman).

Ophiodiplax disjuncta, Koehler, 1911. Brit. Antarct. Exped., 1907–9. Astéries, Ophiures et Echinides, p. 48, pls. vi, figs. 9–11; vii, fig. 13.

Ophiacantha antarctica, Koehler, 1912. II^e Expéd. Antarct. Française. Echinodermes, p. 137.

Ophiodiplax disjuncta, Koehler, 1912. *Ibid.*, p. 142.

O. disjuncta, Koehler, 1922. Austral. Antarct. Exped. Echinod. Ophiuroidea, p. 15, pl. lxxviii, figs. 4–5, 9–12.

O. disjuncta, Koehler, 1923. Swedish Antarct. Exped. Astéries et Ophiures, p. 105.

O. disjuncta, G. A. Smith, 1923. *Report on the Echinoderms coll. during the voyage of the 'Quest'.* Ann. Mag. Nat. Hist., 9 Ser., XII, p. 369.

O. disjuncta, Mortensen, 1925. *On a small collection of Echinoderms from the Antarctic Sea.* Arkiv för Zoologi, XVII A, No. 31, p. 2.

Ophiacantha disjuncta, Hertz, 1926. Deutsche Südpolar-Exped. Ophiuroiden, p. 38, Taf. vii, fig. 5.

O. antarctica, Grieg, 1929. *Some Echinoderms from the S. Shetlands.* Bergens Mus. Årbok, 1929, p. 8.

St. 20. 4. iii. 26. 14·6 miles N 41° E of Cape Saunders, South Georgia, 200 m. 1 specimen.

St. 27. 15. iii. 26. West Cumberland Bay, South Georgia, 110 m. 12 specimens.

St. 39. 25. iii. 26. East Cumberland Bay, South Georgia, 179–235 m. 3 specimens.

St. 42. 1. iv. 26. Off mouth of Cumberland Bay, South Georgia, 120–204 m. Several specimens.

St. 123. 15. xii. 26. Off mouth of Cumberland Bay, South Georgia, 230–250 m. 5 specimens.

St. 140. 23. xii. 26. Stromness Harbour to Larsen Point, South Georgia, 122–136 m. 2 specimens.

St. 144. 5. i. 27. Off mouth of Stromness Harbour, South Georgia, 155–178 m. Several specimens.

St. 148. 9. i. 27. Off Cape Saunders, South Georgia, 132–148 m. 1 specimen.

St. 152. 17. i. 27. 53° 51′ S, 36° 18′ W, South Georgia, 245 m. 2 specimens.

St. 156. 20. i. 27. 53° 51′ S, 36° 21′ W, South Georgia, 200–236 m. 1 specimen.

St. 159. 21. i. 27. 53° 52′ S, 36° 08′ W, South Georgia, 160 m. 2 specimens.

St. 160. 7. ii. 27. Near Shag Rocks, South Georgia, 177 m. 1 specimen.

St. 170. 23. ii. 27. Off Cape Bowles, Clarence Island, 342 m. Several specimens.

St. 175. 2. iii. 27. Bransfield Strait, South Shetlands, 200 m. Several specimens.

St. 177. 5. iii. 27. 27 miles SW of Deception Island, South Shetlands, 1080 m. 1 specimen.

St. 180. 11. iii. 27. Schollaert Channel, Palmer Archipelago, 160 m. 1 specimen.

St. 181. 12. iii. 27. Schollaert Channel, Palmer Archipelago, 160–335 m. 5 specimens.

St. 182. 14. iii. 27. Schollaert Channel, Palmer Archipelago, 278–500 m. 1 specimen.

St 187. 18. iii. 27. Neumayr Channel, Palmer Archipelago, 259–354 m. 15 specimens.

St. 190. 24. iii. 27. Bismarck Strait, Palmer Archipelago, 90–130 m. and 315 m. Several specimens from both depths.

St. 195. 30. iii. 27. Admiralty Bay, King George Island, South Shetlands, 391 m. 15 specimens.

St. 363. 26. ii. 30. Off Zavodovski Island, South Sandwich Islands, 329–278 m. 8 specimens (1 6-rayed).

St. 599. 17. i. 31. 67° 08′ S, 69° 06′ W, 203 m. 10 specimens.

St. 600. 17. i. 31. 67° 09′ S, 69° 27′ W, 501–527 m. 4 specimens.

St. WS 42. 7. i. 27. 54° 42′ S, 36° 44′ W, South Georgia, 198 m. 12 specimens.

Some of the specimens are infested by the ectoparasitic Copepod *Cancerillopsis*, one of them (St. 599) by the entoparasite *Ophioika*.

There cannot be the slightest doubt that Koehler's *Ophiodiplax disjuncta* is identical with the species described by him in 1901 under the name *Ophiacantha antarctica*. From the descriptions and figures this is indeed quite evident; it is true the division of the dorsal arm plates was not observed by Koehler in his *O. antarctica*, but in a co-type sent me from the Brussels Museum I find them very well developed. No further discussion on the question of the identity of the two "species" is needed. It is curious that Koehler, in recording both *O. antarctica* and *Ophiodiplax disjuncta* in his work of 1912 did not notice their similarity.

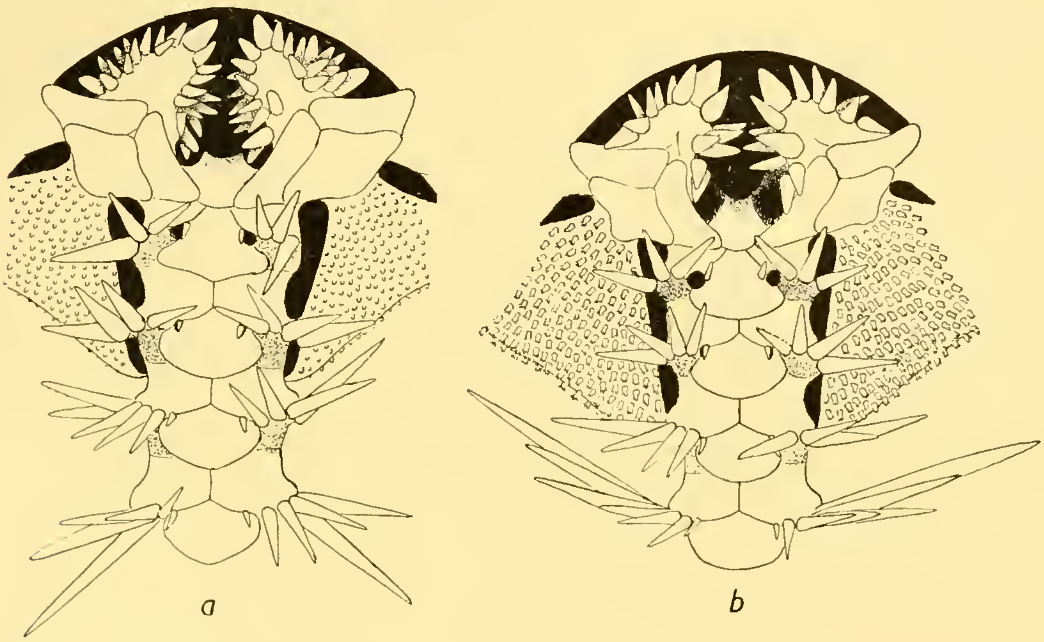


Fig. 7. *Ophiacantha disjuncta* (Koehler). Part of oral side of two specimens, showing variation in the development of the mouth papillae. ×12.

The name *antarctica*, though the older of the two, cannot be used for the species, as there already is the *Ophiacantha antarctica* (Lyman) originally referred by Lyman to *Ophioconis*, but quite evidently an *Ophiacantha*; thus the name *disjuncta* has to be used for this species.

As for the genus *Ophiodiplax*, Hertz has rejected it and included the species in the genus *Ophiacantha*, and I quite agree that the characters of the divided dorsal plates and the more or less conspicuous continuation of disk spinules on to the dorsal side of arms do not afford sufficient basis for making the species the type of a separate genus. There is, however, another character which might be of generic value—the multiplication of the mouth papillae. In some specimens there are a great number of papillae, placed mainly below the normal ones inside the mouth slits (Fig. 7 *a*); more generally there are only a few of these supernumerary papillae (Fig. 7 *b*), sometimes only one, very rarely none. As pointed out by Koehler in his description of *O. antarctica* this recalls Verrill's

genus *Ophiectodia*, and if we were to recognize that genus, *Ophiodiplax* would be a synonym of it. But I do not think that genus sufficiently well founded.

One of the specimens from St. 363 is 6-rayed, but otherwise conforms with the typical *disjuncta*. This species is *not* viviparous; but the eggs are very large, so that there is hardly the possibility that the larva *Ophiopluteus irregularis*, Mortensen, can actually belong to it, as suggested in my report on the Echinoderm larvae of the German South Polar Expedition, p. 96.

Ophiacantha antarctica (Lyman)

Ophioconis antarctica, Lyman, 1882. 'Challenger' Oph., p. 107, pl. xxiii, figs. 1–3.
Ophiacantha polaris, Koehler, 1901. Result. Voyage 'Belgica'. Echinides et Ophiures, p. 32, pl. iii, figs. 19–21.
O. polaris, Koehler, 1912. II^e Expéd. Antarct. Française. Echinodermes, p. 137.
Ophioconis antarctica, Hertz, 1926. Deutsche Südpolar-Exped. Ophiuroiden, p. 40.
Non: Ophiacantha antarctica, Koehler, 1901. Result. Voyage 'Belgica'. Echinides et Ophiures, p. 34, pl. iv, figs. 23–25 (= *Ophiacantha disjuncta* (Koehler)).

St. 170. 23. ii. 27. Off Cape Bowles, Clarence Island, 342 m. 2 specimens.
St. 172. 5. iii. 27. Off Deception Island, South Shetlands, 525 m. 1 specimen.
St. 181. 12. iii. 27. Schollaert Channel, Palmer Archipelago, 160–335 m. 2 specimens.
St. 186. 16. iii. 27. Fournier Bay, Anvers Island, Palmer Archipelago, 295 m. 1 specimen.
St. 363. 26. ii. 30. South Sandwich Islands, 329–278 m. 10 specimens.

Whereas I quite agree with Dr Hertz that Koehler's *Ophiacantha polaris* is indistinguishable from Lyman's *Ophioconis antarctica*, I cannot agree with her in retaining it in the genus *Ophioconis*. Without entering here on a discussion of Matsumoto's subdivision of the genus *Ophioconis* I would merely point out the peculiar character of the teeth in the genotype, *O. Forbesi* (Heller): broad, rounded, with a clear enamel-like border; this is so different from the shape of the teeth in *O. antarctica*: narrow, pointed like mouth papillae, and not enamel-like, that the two species cannot reasonably be referred to the same genus. *O. antarctica* is clearly an *Ophiacantha*, of the group designated by Verrill as *Ophiolimna*. Whether the latter should be maintained as a separate genus or as a subgenus of *Ophiacantha* is rather a matter of taste.

This species has separate sexes and appears not to be viviparous. But the eggs are large and yolky, which would seem to indicate that it has direct development, without a pelagic larval stage. In my report on 'Die Echinodermenlarven der Deutschen Süd-Polar Expedition', 1913, p. 96, I have suggested that the larva *Ophiopluteus irregularis* described there (p. 94, Taf. xiii, fig. 2; xiv, fig. 3; xv, figs. 1–3) may belong to *Ophiacantha antarctica*. This is, however, not the present species *O. antarctica* (Lyman), but the *O. antarctica* of Koehler, which must henceforth be named *O. disjuncta* (Koehler). The question whether the said larva may really belong to this latter species is discussed above.

The fact that several of the specimens in hand have the skin of the disk more or less lacerated (dissolved) indicates a peculiar histological character of the skin which exists in several Ophiurids, particularly among the Ophiomyxids, causing the skin to dissolve when the specimen is left out of the water for a few moments. This is evidently the case also in *O. Bairdi*, Lyman, the genotype of the subdivision *Ophiolimna*, to which *Ophiacantha antarctica* belongs.

Ophiacantha angolensis var. inermis, n.var.

St. 279. 10. viii. 27. Off Cape Lopez, French Congo, 58–67 m. 3 specimens.

These small Ophiacanthas (2–4 mm. diameter of disk) so strikingly recall *O. angolensis*, described by Koehler in his paper *Sur quelques Ophiures des côtes de l'Angola et du Cap* (Göteborgs K. Vetensk. Vitterh. Samh. Handl., XXV, 5, p. 4, pl. i, figs. 4–5), that one is much tempted to regard them as identical. There are, however, some differences which forbid such a course. In the typical *angolensis* the small stumps covering the disk terminate usually in three distinct, diverging spinules; in the present specimens these stumps terminate in a simple point. The arm spines are distinctly thorny in the proximal part of the arms in the typical *angolensis*, smooth in the present specimens; further the buccal shields have in general a more distinct outer lobe in these specimens than is the case in the typical *angolensis*. Otherwise the resemblance is complete: the shape of the dorsal and ventral arm plates, the strongly moniliform and much convoluted arms, the number of arm spines (5–4), the small tentacle scale, the three simple mouth papillae, the brownish colour. Also the locality and depth (*O. angolensis* was taken off Port Alexander, Angola, 73 m.) being much the same, the probability is that the differences pointed out are only individual variations. However, since the three present specimens are all alike, I think it preferable to designate them as a variety of *angolensis*. If, when more material comes to hand, it is found that the characters pointed out here are subject to variation so as not to be reliable for distinguishing between the typical form and the variety, the latter may be withdrawn.

The director of the Gothenburg Museum, my friend Professor L. A. Jägerskjöld has very kindly lent me the type specimen of *Ophiacantha angolensis*, so that I have been able to compare it with the three specimens in the present collection.

Ophiacantha (Ophiotreta) sp.

Ophiacantha Valenciennesi, Koehler, 1908. Scott. Nat. Antarct. Exped. Astéries, Ophiures et Echinides, p. 608.

St. 399. 18. v. 30. Gough Island, 102–141 m. Some young specimens.

These specimens, no doubt, are identical with those from the same locality referred by Koehler (*op. cit.*) to *O. Valenciennesi*, Lyman. They are all very young, 2–3 mm. diameter of disk, only one of them being as large as 6 mm. diameter of disk. Referring to the discussion of the Atlantic forms designated as *O. Valenciennesi* given in my work on the Ophiuridae of the "Ingolf" Expedition (1933, pp. 34–7), I find it impossible to identify these young specimens with certainty as *O. Valenciennesi* (as I had to leave unidentified a similar young specimen from St Helena (Echinoderms of St Helena, 1933, p. 440). The proximal spines are not widened or bifid at the point, as usual in the adults of *O. Valenciennesi*. The colour is a brownish mottled, the arms banded with white and brownish.

A larger material, particularly of adult specimens, will be necessary for settling the question of the identity of this South Atlantic form of *Ophiotreta*.

Ophiomitrella ingrata, Koehler

Ophiomitrella ingrata, Koehler, 1908. Scott. Nat. Antarct. Exped. Astéries, Ophiures et Echinides, p. 613, pl. xiv, figs. 126–127.

St. 399. 18. v. 30. Off Gough Island, 102–141 m. Several specimens.

Ophiomitrella falklandica, n.sp.

(Plate VII, fig. 5)

Ophioripa ingrata, Koehler, 1923. Swedish Antarct. Exped. Astéries et Ophiures, p. 106, pl. xiv, figs. 4–6.

St. 175. 2. iii. 27. Bransfield Strait, South Shetlands, 200 m. 2 specimens.
St. 652. 14. iii. 31. Burdwood Bank, 169–171 m. 5 specimens.
St. WS 83. 24. iii. 27. 14 miles S 64° W of George Island, East Falkland Islands, 137–129 m. 1 specimen.
St. WS 85. 25. iii. 27. 8 miles S 66° E of Lively Island, East Falkland Islands, 79 m. 3 specimens.
St. WS 228. 30. vi. 28. 50° 50′ S, 56° 58′ W, Falkland Islands, 229–236 m. 1 specimen.
St. WS 246. 19. vii. 28. 52° 25′ S, 61° 00′ W, Falkland Islands, 267–208 m. 3 specimens.
St. WS 248. 20. vii. 28. 52° 40′ S, 58° 30′ W, Falkland Islands, 210–242 m. 5 specimens.
St. WS 773. 31. x. 31. 47° 28′ S, 60° 51′ W, 291–296 m. 4 specimens.
St. WS 804. 6. i. 32. 50° 21′ S, 62° 53′ W, Falkland Islands, 143–150 m. 1 specimen.
St. WS 824. 19. i. 32. 52° 29′ S, 58° 27′ W, Falkland Islands, 146–137 m. 4 specimens.
St. WS 825. 29. i. 32. 50° 50′ S, 57° 15′ W, Falkland Islands, 135–144 m. 4 specimens.
St. WS 829. 31. i. 32. 50° 51′ S, 63° 13′ W, Falkland Islands, 155 m. 4 specimens.
St. WS 840. 6. ii. 32. 53° 52′ S, 61° 49′ W, Falkland Islands, 368–463 m. 5 specimens.
St. WS 871. 1. iv. 32. 53° 16′ S, 64° 12′ W, Falkland Islands, 336–341 m. 1 specimen.

The specimens from off the Falkland Islands and from the Burdwood Bank are regarded by Koehler (*op. cit.*) as identical with the species from Gough Island, originally described by Koehler as *Ophiomitrella ingrata*, but in his work on the Asterids and Ophiurids of the Swedish Antarctic Expedition (*loc. cit.*) transferred to the genus *Ophioripa*; but in my opinion they decidedly represent a different species. As appears from the figures given here of the two species (Figs. 8 *a–d*), the species from the Falkland region differs from *O. ingrata*, in addition to its much larger size (up to 9 mm. diameter of disk, *O. ingrata* not surpassing a diameter of 5 mm.), in being in general much coarser. This is seen clearly even in young specimens, as shown in the figures which are drawn from specimens of 3·5 mm. diameter of both species; in the larger specimens this difference is much more conspicuous. It is in the arm spines, the grains of the disk, and the mouth papillae that this difference is to be found, as seen from the figures; in both, however, they are finely thorny and rough. In the ventral and dorsal arm plates there is no distinct difference, but the radial shields afford a good and apparently constant difference, being widely separated in *falklandica* and contiguous in *ingrata*. The difference in the shape of the buccal shields shown in the figures is less reliable. It may be added that the granules of the disk in *falklandica* are often more elongate and quite club-shaped, recalling, indeed, the condition found in *Ophioripa conferta*, Koehler. As a matter of fact *O. falklandica* very much recalls *Ophioripa conferta* from off Maria Island, Tas-

mania, described by Koehler in his report on the Ophiuroids of the Australasian Antarctic Expedition (p. 19, pl. lxxxv, figs. 9–13), and I would not be altogether too

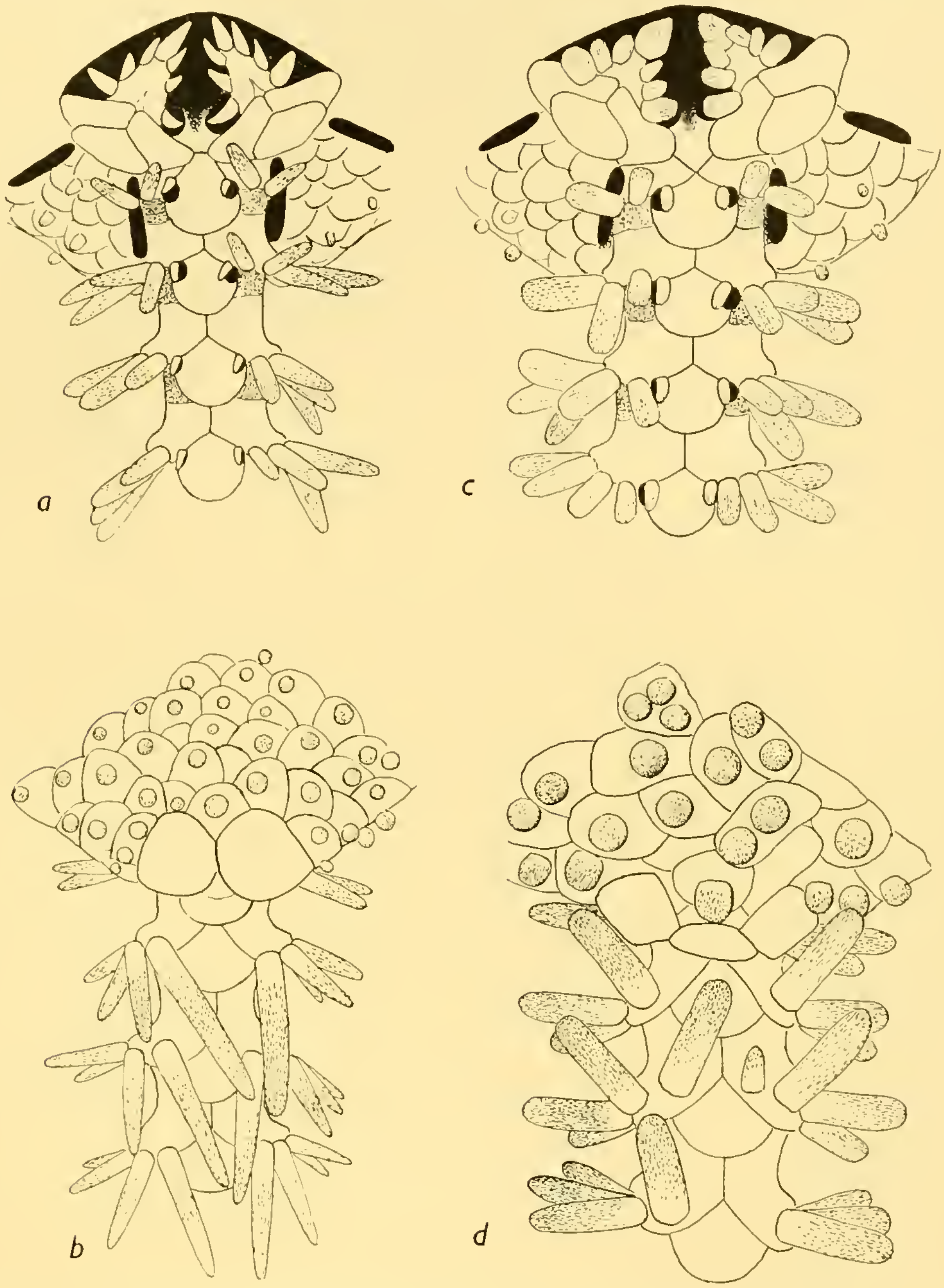


Fig. 8 *a*, *b*. *Ophiomitrella ingrata*, Koehler. Part of oral side (*a*) and dorsal side (*b*).
Fig. 8 *c*, *d*. *Ophiomitrella falklandica*, n.sp. Part of oral side (*c*) and dorsal side (*d*). ×22·5.

surprised if it were ultimately to be found that the two are identical. But for the present I do not venture to state definitely that the South American specimens, from depths of 79–463 m. (Koehler even records a specimen from 40 m.), are identical with the deep-sea species *O. conferta*, known only from off Tasmania from a depth of 2340 m.

Both O. ingrata and O. falklandica are viviparous. In my Echinoderms of South Africa (Vid. Medd. Dansk Naturh. Foren. XCIII, 1933, p. 333) I have stated, in discussing the viviparous South African species *Ophiomitrella corynephora*, H. L. Clark, that *O. ingrata* appears not to be viviparous, judging from the scarce material at that time available to me. This, however, is not so. *O. ingrata is viviparous.* There appears to be only one young at a time in each bursa, reaching a very large size so as to fill up the bursa completely. Further, *O. ingrata* is a *protandric hermaphrodite*, the young specimens being mainly males, the adult specimens females. In a specimen of 4 mm. diameter I found a very large testis distally on the adradial side of the bursae and a small female gonad on the interradial side. In the largest specimens there may still be traces of male sexual products in gonads which otherwise contain eggs.

O. falklandica is also viviparous and in general a protandric hermaphrodite. As I have found an adult specimen (7 mm. diameter of disk) to be purely male, it would seem that some specimens perhaps remain males throughout life—or perhaps become pure males again after having been hermaphrodites. There are two to five young ones at a time, of the same size, in each bursa, the young ones, which reach a considerable size with up to twelve arm joints, being jammed together in the most extraordinary way so that one wonders how they manage to get out of the bursae. In one specimen, which had only one to two young ones left in the bursae, the next batch of embryos were already found, squeezed in between the arms of the young ones, and of so irregular shape that it is astonishing that they could develop into regular brittle-stars. One of the young ones had a young embryo in its mouth, evidently in the act of devouring it—rather a peculiar case, analogous to that of the Comatulid, *Isometra vivipara*, in which the Pentacrinoids, attached to the cirri of the mother, catch and devour their sister and brother larvae, on their passage from the marsupium in the pinnulae down to the cirri (cf. Mortensen, 1918, The Crinoidea of the Swedish Antarctic Expedition, VI, 8, p. 15).

One of the specimens from St. WS 773 contains the remarkable parasitic Copepod *Ophioika*, Stephensen.

Koehler has transferred the species *ingrata*, including *falklandica*, from *Ophiomitrella* to his new genus *Ophioripa*, established in his work on the Ophiurans of the Philippine Seas (Bull. U.S. Nat. Mus., No. 100, 1922, p. 117), this genus differing from *Ophiomitrella* "in the large dorsal plates of the disk, which are provided with a transparent border, in the very small under arm plates, and in the wide separation along the median dorsal line of the arm of the columns of arm spines". I think this genus rather poorly characterized, and in any case, I do not see any sufficient reason for removing the species *ingrata*, or *falklandica*, from the genus *Ophiomitrella*. I would particularly emphasize that there is no transparent border on the dorsal plates of the disk, a feature which Koehler emphasizes as characteristic of the genus *Ophioripa*.

As stated in my Echinoderms of South Africa (*loc. cit.*) the bursae are separate in *ingrata*, and the same holds good of *falklandica*, in contradistinction to the South African *O. corynephora*. The bursae, when containing the large young ones, fill up the disk to such a degree that there is hardly room for the stomach, so that it would seem to

be difficult for the mother animal to get sufficient nourishment, a situation apparently the more precarious since it appears that breeding goes on constantly, when once started.

One of the specimens from St. 175, a young one of only 2·2 mm. diameter of disk, differs from the other specimens in the stumps of the disk being long and slender, recalling, as a matter of fact, the *Ophiacantha paramedea* of Hertz (Deutsche Südpolar Exped. Ophiuroiden, p. 39, Taf. vii, fig. 6; viii, figs. 1–2). However, a comparison with young ones of *O. falklandica* taken out of the bursae leaves no doubt that this specimen is only a newly born *O. falklandica*, the spines of the disk being equally long and slender in the still unborn young ones. By this I do not mean to say that *Ophiacantha paramedea* is only a young *Ophiomitrella falklandica*. The fact that the specimens of the *O. paramedea* were 4–5 mm. in diameter of disk, shows that they cannot be identical with *O. falklandica*, for specimens of the latter of this size have the same general appearance as the adult. This, however, is not the place to discuss the species *Ophiacantha paramedea*.

Ophiochondrus stelliger, Lyman

Ophiochondrus stelliger, Lyman, 1882. Sci. Results H.M.S. 'Challenger'. Ophiuroidea, p. 247, pl. xxi, figs. 13–15.

O. falklandicus, Koehler, 1923. Swedish Antarct. Exped. Astéries et Ophiures, p. 103, pl. xiv, figs. 2–3.

St. WS 228. 30. vi. 28. 50° 50′ S, 56° 58′ W, off Falkland Islands, 229–236 m. 3 specimens.
St. WS 824. 19. i. 32. 52° 29′ S, 58° 27′ W, off Falkland Islands, 146–137 m. 2 specimens.
St. WS 871. 1. iv. 32. 53° 16′ S, 64° 12′ W, off Falkland Islands, 336–341 m. 1 specimen.

There is no doubt but that these specimens are identical with Koehler's *O. falklandicus*; but it is equally certain that this latter is again identical with Lyman's *O. stelliger*. That they were closely related was observed by Koehler, who, however, thought them to differ, *O. falklandicus* having only three arm spines, of about equal length, whereas *O. stelliger* has four, the upper one much the longest. Further, the buccal shields were supposed to be different, Lyman's pl. xxi, fig. 13, showing the shape of the buccal shield much broader than that of *falklandicus*, as seen in pl. xiv, fig. 3, of Koehler's work. Another difference of much more importance escaped the attention of Koehler, viz. that the genital slits in *O. stelliger* are shown in Lyman's figure to be long, reaching to the very edge of the disk, whereas in Koehler's species they are only half that length.

Finding, however, that in the present specimens there are on the proximal joints actually four arm-spines, the upper one distinctly the longest, I strongly suspected the two other differences to be due to incorrect drawing. At my request Mr Dilwyn John very kindly sent me a camera sketch of the oral side of the type specimen, which shows the genital slits to be short as in *falklandicus* and the buccal shields of exactly the same shape as in *falklandicus*. Thus the identity of *O. falklandicus* with *O. stelliger* is definitely proved.

From a zoogeographical point of view this identity is also acceptable, the type locality, off La Plata (1080 m.), being essentially within the same region as the Falkland Islands; the species is known from only these two localities.

O. stelliger is viviparous and hermaphrodite. There are two to three gonads on the interradial, one on the adradial side of each bursal slit; it is the single gonads which are hermaphrodite, containing both sperms and eggs at the same time.

Only a single egg develops at a time, and apparently only one at a time in each interradius. The young ones reach a large size and may be discerned quite distinctly through the thin, rather transparent skin of the dorsal side of the disk. This is something quite unusual; it is due to the fact that the stomach does not, as is usual, spread over the whole dorsal side, by its dark colour concealing the underlying embryos, but is compressed between the young ones, squeezed into narrow strands, forming a kind of reticulation between the young ones.

In one gonad I observed something recalling the curious parasitic organism *Nidrosia ophiurae*, which I have described from *Ophiura Sarsi* (Danish 'Ingolf' Exped. Ophiuroidea, p. 74). I cannot, however, state definitely that it is the same.

Family OPHIOCOMIDAE

Ophiocoma Bollonsi, Farquhar

Ophiocoma Bollonsi, Farquhar, 1908. *Description of a new Ophiurid.* Trans. N. Zealand Inst., XL, p. 108.

O. Bollonsi, H. L. Clark, 1921. *The Echinoderm Fauna of Torres Strait.* Publ. Carnegie Inst., 214, p. 132.

O. Bollonsi, Mortensen, 1924. *Echinoderms of New Zealand and the Auckland-Campbell Islands. II. Ophiuroidea.* Papers from Dr Th. Mortensen's Pacific Exped., XX (Vid. Medd. Dansk Naturh. Foren., 77), p. 120.

St. 941. 20. viii. 31. 40° 53′ S, 174° 47′ E, Cook Strait, New Zealand, 128 m. 1 specimen.

Although the spines of this specimen can scarcely be said to be canaliculate, there is no doubt that it belongs to *O. Bollonsi*, Farquhar. Some of the spines are club-shaped, on account of some kind of parasitic organism, as mentioned in my paper of 1924 (p. 122).

Each dorsal arm plate has a narrow, white transverse band, the ground colour being brownish. This gives the arms a finely banded appearance.

Ophiopsila guineensis, Koehler

Ophiopsila guineensis, Koehler, 1914. Meeresfauna Westafrikas. Echinoderma, p. 203, pl. viii, figs. 1–4, 7–8.

St. 283. 13. viii. 27. Off Annobon, Gulf of Guinea, 18–30 m. 2 specimens.

To Koehler's description of this species I would only add that the ventral interradii are naked proximally, and that the disk, which is preserved in one of the specimens, is whitish with black, not reddish brown spots, as was the case in the types. Otherwise these specimens are in good agreement with Koehler's description.

Ophiopsila platyspina, Koehler

Ophiopsila platyspina, Koehler, 1914. Meeresfauna Westafrikas. Echinoderma, p. 206, pl. viii, figs. 10–11.

St. 283. 13. viii. 27. Off Annobon, Gulf of Guinea, 18–30 m. 6 specimens and some broken arms.

Although Koehler's description is based on only a single, poorly preserved specimen there is scarcely anything to be added. I would say that his statement that the dorsal arm plates are covered with "gros granules très apparents" is a little exaggerated, as it requires considerable magnification—some 25–30 times—to see them clearly, and with such magnification the same thing can be seen in many other Ophiurids (also in *Ophiopsila guineensis*, though not quite as conspicuous as in *O. platyspina*), owing to the microscopic structure of the plates.

The colour of the disk is rather variable; one specimen shows a fine reticulation of blackish and whitish, the others have some large irregular, blackish spots, surrounded by whitish, on a reddish brown ground. The colour of the arms—reddish brown, with a narrow band of blackish or dark grayish on about every fourth or fifth joint—is very characteristic and makes even fragments of arms easily recognizable.

Family OPHIOTHRICHIDAE

Ophiothrix triglochis, Müller and Troschel

Ophiothrix triglochis, Müller and Troschel, 1842. System d. Asteriden, p. 114.

O. triglochis, Koehler, 1904. *Ophiures nouveaux ou peu connues.* Mém. Soc. Zool. France, 1904, p. 81.

O. triglochis, H. L. Clark, 1923. *Echinoderm Fauna of South Africa.* Ann. S. African Mus., XIII, p. 337.

O. triglochis, Mortensen, 1933. *Echinoderms of South Africa.* Papers from Dr Th. Mortensen's Pacific Exped., XX (Vid. Medd. Dansk Naturh. Foren., 77), p. 337.

Other literary references are given in my paper of 1933, *loc. cit.*

St. 90. 10. vii. 26. Simonstown, False Bay, South Africa, 10 m. 8 specimens.
St. 91. 8. ix. 26. Off Roman Rock, False Bay, South Africa, 35 m. 2 specimens.

Ophiothrix fragilis (Abildgård)

Ophiothrix fragilis, H. L. Clark, 1923. *Echinoderm Fauna of South Africa.* Ann. S. African Mus., XIII, p. 337.

O. fragilis, Mortensen, 1933. Danish 'Ingolf' Exped. Ophiuroidea, IV, 8, p. 45, pl. i, figs. 1–7.

For further literary references see my work on the 'Ingolf' Ophiuroidea, *loc. cit.*

1926. Saldanha Bay. Littoral. 3 specimens.

Ophiothrix roseo-coerulans, Grube

Ophiothrix roseo-coerulans, Mortensen, 1933. *The Echinoderms of St Helena (other than Crinoids)*. Papers from Dr Th. Mortensen's Pacific Exped., 1914–16, LXVI (Vid. Medd. Dansk Naturh. Foren., 93), p. 440, pl. xxii, figs. 5–7.

For other literary references, see the paper quoted.

St. 1. 16. xi. 25. Clarence Bay, Ascension, 16–27 m. Several specimens.
St. 2. 17. xi. 25. Ascension. Littoral. 8 specimens.

The species was hitherto known only from St Helena, but its occurrence at Ascension was to be expected, so it is very satisfactory that it has now actually been found there.

Family OPHIACTIDAE

Ophiactis asperula (Philippi)

Ophiactis asperula, Ludwig, 1898. *Die Ophiuren der Sammlung Plate*. Zool. Jahrbücher, Suppl., pp. 752–5.

O. asperula, Ludwig, 1899. Ophiuroideen Hamburger Magalh. Sammelreise, p. 6.

O. asperula, H. L. Clark, 1915. Cat. Recent Ophiurans, p. 259, pl. x, figs. 11–12.

O. asperula, H. L. Clark, 1918. *Brittle-Stars, new and old*. Bull. Mus. Comp. Zool., LXII, pp. 300, 310.

O. asperula, Mortensen, 1920. *On Hermaphroditism in viviparous Ophiurids*. Acta Zoologica, I, p. 4.

O. asperula, Koehler, 1922. Austral. Antarct. Exped. Echinod. Ophiuroidea, p. 36, pl. lxxxi, figs. 8–9.

O. asperula, Koehler, 1923. Swedish Antarct. Exped. Astéries et Ophiures, p. 116.

For references to the older literature see Ludwig, *op. cit.*

St. 48. 3. v. 26. 8·3 miles N 51° E of Port William, Falkland Islands, 105–115 m. 5 specimens.
St. 51. 4. v. 26. Off Eddystone Rock, East Falkland Islands, 105–115 m. 18 specimens.
St. 52. 5. v. 26. Port William, East Falkland Islands, 17 m. 3 specimens.
St. 55. 16. v. 26. Entrance to Port Stanley, East Falkland Islands, 10–16 m. 3 specimens.
St. 56. 16. v. 26. Port William, East Falkland Islands, 10½–16 m. 4 specimens.
St. 57. 16. v. 26. Port William, East Falkland Islands, 15 m. Several specimens.
St. 388. 16. iv. 30. 56° 19′ S, 67° 10′ W, off Cape Horn, 121 m. 18 specimens.
St. 652. 14. iii. 31. Burdwood Bank, 171–169 m. Several specimens.
St. 724. 16. xi. 31. Fortescue Bay, Magellan Strait, 0–5 m. 15 specimens.
St. 1321. 16. iii. 34. Cockburn Channel, Tierra del Fuego, 66 m. Several specimens.
St. WS 73. 6. iii. 27. 51° 01′ S, 58° 54′ W, East Falkland Islands, 121 m. Several specimens.
St. WS 79. 13. iii. 27. 51° 01′ S, 64° 59′ W, 132–131 m. 2 specimens.
St. WS 80. 13. iii. 27. 50° 57′ S, 63° 37′ W, 152–156 m. Numerous specimens.
St. WS 81. 19. iii. 27. 8 miles N 11° W of North Island, West Falkland Islands, 81–82 m. 2 specimens.
St. WS 82. 21. iii. 27. 54° 06′ S, 57° 46′ W, Burdwood Bank, 140–144 m. 12 specimens.
St. WS 83. 24. iii. 27. 14 miles S 64° W of George's Islands, East Falkland Islands, 137–129 m. 3 specimens.
St. WS 84. 24. iii. 27. 7·5 miles S 9° W of Sea Lion Island, East Falkland Islands, 75–74 m. Numerous specimens.
St. WS 85. 25. iii. 27. 8 miles S 26° E of Lively Island, East Falkland Islands, 79 m. Numerous specimens.

St. WS 88. 6. iv. 27. 54° 00′ S, 64° 57′ W, 118 m. Several specimens.
St. WS 93. 9. iv. 27. 7 miles S 80° W of Beaver Island, East Falkland Islands, 133 m. 5 specimens.
St. WS 109. 26. iv. 27. 50° 19′ S, 58° 28′ W, 145 m. 1 specimen.
St. WS 210. 29. v. 28. 50° 17′ S, 60° 06′ W, 161 m. 2 specimens.
St. WS 221. 4. vi. 28. 48° 23′ S, 65° 10′ W, 76–91 m. 11 specimens.
St. WS 225. 9. iv. 28. 50° 20′ S, 62° 30′ W, 162–161 m. Several specimens.
St. WS 228. 30. vi. 28. 50° 50′ S, 56° 58′ W, 229–236 m. 4 specimens.
St. WS 231. 4. vii. 28. 50° 10′ S, 58° 42′ W, 167–159 m. 2 specimens.
St. WS 239. 15. vii. 28. 51° 10′ S, 62° 10′ W, 196–193 m. 3 specimens.
St. WS 243. 17. vii. 28. 51° 06′ S, 64° 30′ W, 144–141 m. 5 specimens.
St. WS 246. 19. vii. 28. 52° 25′ S, 61° 00′ W, 267–208 m. 4 specimens.
St. WS 247. 19. vii. 28. 52° 40′ S, 60° 05′ W, 172 m. 5 specimens.
St. WS 248. 20. vii. 28. 52° 40′ S, 58° 30′ W, 210–242 m. 15 specimens.
St. WS 249. 20. vii. 28. 52° 10′ S, 57° 30′ W, 166 m. 1 specimen.
St. WS 576. 17. iv. 31. 51° 35′ S, 57° 50′ W, 34–24 m. 2 specimens.
St. WS 583. 2. v. 31. 53° 39′ S, 70° 54′ W, 14–78 m. Numerous specimens.
St. WS 755. 21. ix. 31. 51° 39′ S, 57° 39′ W, 77 m. Numerous specimens.
St. WS 761. 13. x. 31. 44° 22′ S, 63° 02′ W, 97 (–0) m. 4 specimens.
St. WS 771. 29. x. 31. 42° 42′ S, 60° 31′ W, 90 m. 4 specimens.
St. WS 776. 3. xi. 31. 46° 18′ S, 65° 02′ W, 107–99 m. 7 specimens.
St. WS 781. 6. xi. 31. 50° 30′ S, 58° 50′ W, 148 m. 10 specimens.
St. WS 782. 4. xii. 31. 50° 28′ S, 58° 30′ W, 141–146 m. 5 specimens.
St. WS 785. 6. xii. 31. 49° 25′ S, 62° 37′ W, 150–146 m. 6 specimens.
St. WS 804. 6. i. 32. 50° 21′ S, 62° 53′ W, 143–150 m. 2 specimens.
St. WS 814. 13. i. 32. 51° 45′ S, 66° 40′ W, 111–118 m. Several specimens.
St. WS 823. 19. i. 32. 52° 14′ S, 60° 01′ W, 80–95 m. 1 specimen.
St. WS 824. 19. i. 32. 52° 29′ S, 58° 27′ W, 146–137 m. 18 specimens.
St. WS 825. 29. i. 32. 50° 50′ S, 57° 15′ W, 135–144 m. Several specimens.
St. WS 836. 3. ii. 32. 55° 05′ S, 67° 38′ W, 64 m. 2 specimens.
St. WS 837. 3. ii. 32. 52° 49′ S, 66° 28′ W, 98–102 m. 3 specimens.
St. WS 841. 6. ii. 32. 54° 12′ S, 60° 21′ W, 109–120 m. 11 specimens.
St. WS 848. 10. ii. 32. 50° 37′ S, 66° 24′ W, 115–117 m. 2 specimens.
St. WS 869. 31. iii. 32. 52° 15′ S, 64° 14′ W, 187 (–0) m. 1 specimen.
6. v. 31. Puerto Bueno. Sarmiento Channel, Magellan Strait, 13 m. 2 specimens.
7. v. 31. Ringdove Inlet. Wide Channel, Magellan Strait. 1 specimen.

The numerous specimens of this well-known species call for no special remarks, excepting two from St. WS 88, which are regenerating the disk that must have been torn away in some way or another. Further, a specimen from St. WS 85 has one arm quite rudimentary, not projecting beyond the disk, although the corresponding part of the mouth frame is normally developed.

The species very strikingly recalls the North Atlantic *O. Balli*, Thompson, but is somewhat more robust. Like the latter it may be found between the layers of the parchment-like tubes of *Chaetopterus*. It is also frequently found in sponges. It also very much resembles the North Atlantic *Ophiopholis aculeata*, which is, indeed, a close relation of *Ophiactis*.

That the species is not viviparous (or brood-protecting) as suggested by Ludwig (*Brutpflege bei Echinodermen*, Zool. Jahrb., Suppl. VII, 1904) I have shown in my paper

On Hermaphroditism in viviparous Ophiurids (1920, p. 4), the very numerous small eggs excluding the possibility of viviparity or brood-protection. The examination of the rich material in this collection confirms this statement. No doubt it has a typical *Ophiopluteus* larva, as has its near relation *Ophiactis Balli*.

Ophiactis Savignyi (Müller and Troschel)

Ophiactis Savignyi, Koehler, 1914. Meeresfauna Westafrikas. Echinoderma, p. 184, pls. vii, fig. 15; x, figs. 1–3.
O. Savignyi, Mortensen, 1933. *Echinoderms of South Africa.* Papers from Dr Th. Mortensen's Pacific Exped., LXV (Vid. Medd. Dansk Naturh. Foren., 93), p. 348, fig. 58 *b*.
O. Savignyi, Mortensen, 1933. *Echinoderms of St Helena* (*other than Crinoids*). Papers from Dr Th. Mortensen's Pacific Exped. 1914–16, LXVI (Vid. Medd. Dansk Naturh. Foren., 93), p. 442.

St. 1. 16. xi. 25. Clarence Bay, Ascension, 16–27 m. 5 specimens.
St. 283. 14. viii. 27. Annobon, 18–30 m. 4 specimens.

The species had not hitherto been found at Ascension; but its occurrence might well be inferred from the facts that it was found at St Helena (Mortensen, 1933) and at Annobon in the Gulf of Guinea; from the latter locality it was recorded by Koehler, 1914.

Ophiactis nidarosiensis, Mortensen

Ophiactis nidarosiensis, Mortensen, 1920. *Notes on some Scandinavian Echinoderms, with descriptions of two new Ophiurids.* Vid. Medd. Dansk Naturh. Foren., 72, p. 60.
O. nidarosiensis, Mortensen, 1927. Handbook Echinod. Brit. Isles, p. 200.
O. nidarosiensis, Mortensen, 1933. *Echinoderms of South Africa.* Papers from Dr Th. Mortensen's Pacific Exped., LXV (Vid. Medd. Dansk Naturh. Foren., 93), p. 346.
O. nidarosiensis, Mortensen, 1933. Danish 'Ingolf' Exped. Ophiuroidea, p. 51.

St. 399. 18. v. 30. Off Gough Island, 102–141 m. 2 specimens.

After the finding of this species in South African seas (*op. cit.*) there is nothing unexpected in finding it now in material dredged by the 'Discovery II' off Gough Island. The specimens agree perfectly with the type from the Trondhjemfjord.

Ophiactis seminuda, n.sp.

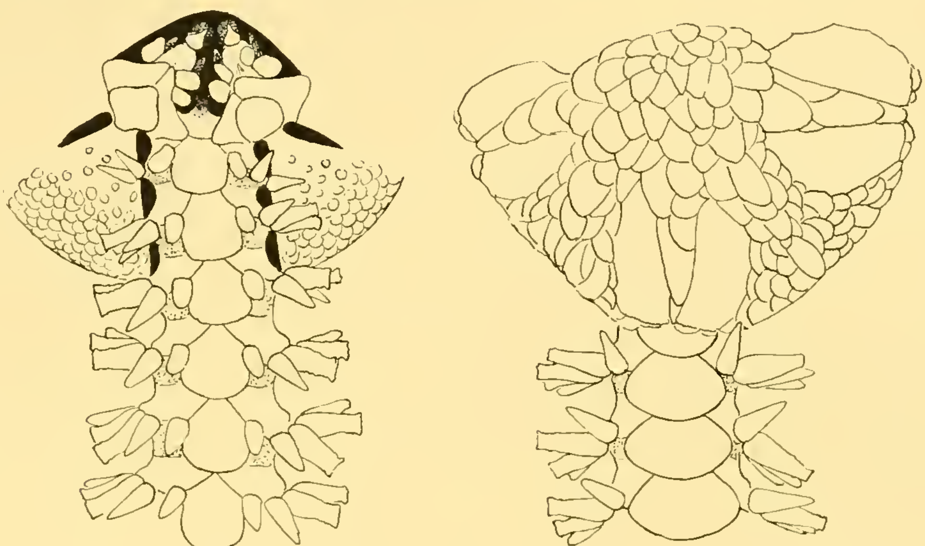
St. 6. 1. ii. 26. Off Tristan da Cunha, 80–140 m. 3 specimens.
St. 1187. 18. xi. 33. Off Tristan da Cunha, 117–106 m. 6 specimens (young).

Diameter of disk of largest specimen scarcely 3 mm.; arms about four to five times the diameter of disk. The largest specimen has five arms, the others have six arms and are self-dividing.

The disk is covered by medium-sized, rather thick scales, among which no primary plates can be made out. One of the specimens has a few pointed spines on the disk, the other specimens have no spines at all on the disk. The ventral interradii are naked in the proximal part. The mouth shields appear to be, typically, almost rhombic, but generally —as is so often the case in self-dividing species—they are more or less irregular in

shape. Adoral shields joining rather widely within. Two broad scale-like outer mouth papillae (exceptionally only one). The infradental papilla is distinctly pointed. Ventral plates a little longer than broad, with convex outer edge; they are rather broadly contiguous in the proximal part of the arms. Dorsal arm plates broadly contiguous in the proximal part of the arms, with convex distal edge; they are somewhat broader than long. Four, exceptionally five, arm spines, which are rather robust; the middle ones are more or less distinctly truncate, flattened, with the edges finely spinulose, the end being somewhat axe-shaped. One large, oval tentacle scale. Colour light greyish or white, the younger specimens with two to three well-defined brownish bands on the arms.

The unusual condition of the ventral interradii being naked in their proximal part forms a marked character of this species; it is, however, not easily ascertained in the



a b

Fig. 9. *Ophiactis seminuda*, n.sp. Part of oral side (*a*) and dorsal side (*b*) ×24.

young specimens. The species does not seem very closely related to any other known species.

Two of the regenerating specimens are remarkable in having only two arms in regeneration, so that here would seem actually to be a case where a five armed adult would be derived from a self-dividing, possibly originally six-armed specimen. But this is the only case I have ever seen among the very numerous self-dividing specimens of *Ophiactis* which I have examined. Another specimen has only one full-grown arm, one somewhat smaller, and three young, regenerating arms. Yet another specimen has two full-grown arms, one opposite the other, and two young regenerating arms on either side. On the whole there is evidently a good deal of irregularity in the propagation by autotomy in this species. At any rate, this single case of regenerating five-armed specimens cannot prove it to be the rule that six-armed self-dividing young specimens end as five-armed adults, as appears to be the opinion of H. L. Clark.

Ophiactis resiliens, Lyman

Ophiactis resiliens, Lyman, 1882. Sci. Results H.M.S. 'Challenger'. Ophiuroidea, p. 115, pl. xx, figs. 7–9.

O. nomentis, Farquhar, 1907. *Notes on New Zealand Echinoderms with description of a new species.* Trans. New Zealand Inst., XXXIX, p. 125.

O. resiliens, Mortensen, 1924. *Echinoderms of New Zealand and the Auckland-Campbell Islands.* II, *Ophiuroidea.* Papers from Dr Th. Mortensen's Pacific Exped., xx (Vid. Medd. Dansk Naturh. Foren., 77), p. 124.

For other literary references see my paper of 1924, *loc. cit.*

St. 941. 20. viii. 32. Cook Strait, 128 m. 1 specimen.

This is a typical specimen of this fine species. It may be mentioned that the dorsal arm plates are partly broken up into smaller, irregular plates; this feature I have not observed in the specimens from New Zealand on which my statements in the work quoted were based, whereas it occurs not uncommonly in Australian specimens. Farquhar, however, has observed it in specimens of his *O. nomentis*, which, as I have shown in my paper quoted, is identical with *O. resiliens*.

Ophiactis profundi, var. Novae-Zelandiae, Mortensen

Ophiactis profundi, var. *Novae-Zelandiae*, Mortensen, 1924. *Echinoderms of New Zealand and the Auckland-Campbell Islands.* II, *Ophiuroidea.* Papers from Dr Th. Mortensen's Pacific Exped., xx (Vid. Medd. Dansk Naturh. Foren., 77), p. 128.

St. 941. 20. viii. 32. 40° 53′ S, 174° 47′ E, Cook Strait, New Zealand, 128 m. 5 specimens.

There is no doubt that these specimens are identical with the form which I described in my paper on the Ophiuroidea of New Zealand as a variety of *Ophiactis profundi*, Lütken and Mortensen. It is possible also that this *O. profundi* may be identical with the West Indian *O. plana*, Lyman.

Not having had the opportunity of comparing directly any West Indian specimen with the Pacific *O. profundi* or the var. *Novae-Zelandiae*, and as the West Indian form has never been sufficiently well figured (the photographic figures given by H. L. Clark in his Catalogue of the Recent Ophiurans, pl. x, figs. 1–2, do not show all the important details clearly), I shall refrain from taking a definite position on the question of the identity or distinctness of the Atlantic and the Pacific forms; I deem it therefore the best course to identify these specimens as—what they are sure to be—*O. profundi*, var. *Novae-Zelandiae*, leaving it to future researches to prove or disprove their identity with the West Indian *O. plana*.

Family AMPHIURIDAE

Amphiura magellanica, Ljungman

Amphiura magellanica, Koehler, 1923. Swedish Antarct. Exped. Astéries et Ophiures, p. 112.

A. magellanica, Mortensen, 1924. *Echinoderms of New Zealand and the Auckland-Campbell Islands.* II, *Ophiuroidea.* Papers from Dr Th. Mortensen's Pacific Exped., xx (Vid. Medd. Dansk Naturh. Foren., 77), p. 132.

For references to the older literature see the latter work, *loc. cit.*

St. 51. 4. v. 26. Off Eddystone Rock, East Falkland Islands, 105–115 m. Several specimens.
St. 399. 18. v. 30. Off Gough Island, 102–141 m. *ca.* 15 specimens.
St. 1321. 16. iii. 34. Cockburn Channel, Tierra del Fuego, 66 m. 13 specimens.
St. WS 84. 24. iii. 27. 7·5 miles S 9° W of Sea Lion Island, East Falkland Islands, 75–74 m. 1 specimen.
St. WS 388. 16. iv. 30. 56° 19′ S, 67° 10′ W, off Cape Horn, 121 m. 12 specimens.

It may be worth mentioning that one of the specimens from Gough Island has only four rays.

Amphiura spinipes, Mortensen

Amphiura spinipes, Mortensen, 1924. *Echinoderms of New Zealand and the Auckland-Campbell Islands.* II, *Ophiuroidea.* Papers from Dr Th. Mortensen's Pacific Exped., xx (Vid. Medd. Dansk Naturh. Foren., 77), p. 134.

St. 929. 16. viii. 32. 34° 31′ S, 172° 48′ E, New Zealand, 58–55 m. 3 specimens.
St. 934. 17. viii. 32. 34° 11′ S, 172° 10′ E, New Zealand, 98 m. 3 specimens.
St. 941. 20. viii. 32. 40° 51′ S, 178° 48′ E, New Zealand, 128 m. Numerous specimens.

These specimens agree perfectly with the type as described and figured in the paper quoted.

Amphiura angularis, Lyman

Amphiura angularis, Lyman, 1879. *Ophiuridae and Astrophytidae of H.M.S. 'Challenger'.* Bull. Mus. Comp. Zool., vi, p. 25, pl. xi, figs. 311–13.
A. angularis, Lyman, 1882. Sci. Results H.M.S. 'Challenger'. Ophiuroidea, p. 134, pl. xxix, figs. 1–3.
A. angularis, Koehler, 1917. *Echinodermes de Kerguelen.* Ann. Inst. Océanogr., VII, 8, p. 67, pl. viii, figs. 13–15.
A. angularis, H. L. Clark, 1923. *Echinoderm Fauna of South Africa.* Ann. S. African Mus., XIII, p. 327.
A. angularis, Mortensen, 1933. *Echinoderms of South Africa.* Papers from Dr Th. Mortensen's Pacific Exped., LXV (Vid. Medd. Dansk Naturh. Foren., 93), p. 354.

St. 1562. 7. iv. 35. 46° 52′ S, 37° 55′ E, off Marion Island, 97–104 m. 2 specimens.
St. 1563. 7. iv. 35. 46° 48′ S, 37° 49′ E, off Marion Island, 113–99 m. 5 specimens.
St. 1564. 7. iv. 35. 46° 36′ S, 38° 02′ E, off Marion Island, 108–113 m. 1 specimen.

As pointed out by Koehler (*op. cit.*) there is some discrepancy between the description and the figures of this species as given by Lyman. In the description it is stated that the ventral interradii are naked and they are thus represented in the figure (pl. xi, fig. 311) of the preliminary report (*op. cit.*, 1879); but pl. xxix, fig. 1 of the Challenger Ophiuroidea shows it wholly covered by scales, in contradiction with the text, which says "interbrachial space below only about one-third covered with minute scaling; the rest of the space is naked". Whether this is due simply to an error in the drawing, or perhaps to two different forms having been confused by Lyman under the name of *A. angularis*, can only be ascertained by a re-examination of the type material. But however this may be, there can be no doubt that it is the form with naked ventral interradii which must be regarded as the typical *A. angularis*. The present specimens all have naked ventral interradii and thus far there can be no doubt of their identity.

There are, however, some other discrepancies. The disk scales are stated by Lyman to be "coarse". I would rather describe the disk scales of the present specimens as very fine. But pl. xi, fig. 312 of the preliminary description shows the scales small and in good accordance with the present specimens. As for the buccal shields there is, as pointed out by Koehler, such great variation in their shape that no reliance can be placed upon them for specific distinction, and likewise in the shape and size of the radial shields there is great variation. Lyman describes and figures the first ventral arm plate as very small; I find it rather larger—a difference which is probably due to some little inaccuracy in the original drawings. On the whole I think it beyond doubt that the present specimens are the typical *A. angularis*, whereas the form described by Koehler (*op. cit.*, 1917) as *A. angularis*, with the ventral interradii wholly covered by scales, should probably rather be regarded as a separate variety of *angularis*. This would then also hold good of the specimens mentioned in my Echinoderms of South Africa (*loc. cit.*) which also have the ventral interradii wholly covered by scales.

It should be mentioned that there may also be a good deal of variation in regard to the tentacle scales. There are sometimes two scales here and there; in one case I even find two scales nearly throughout on two of the arms, the other arms having the normal single scale. In another specimen the tentacle scales are unusually small, and even absent in some places.

The species has separate sexes and is evidently not viviparous.

Amphiura angularis, Lyman, subsp. protecta, Hertz

Amphiura angularis, Lyman, subsp. *protecta*, Hertz, 1926. Deutsche Südpolar-Exped. Ophiuroiden, p. 32, Taf. ix, figs. 8–9.

St. 27. 15. iii. 26. West Cumberland Bay, South Georgia, 110 m. 2 specimens.
St. 42. 1. iv. 26. Off mouth of Cumberland Bay, South Georgia, 120–204 m. 1 specimen.
St. 140. 23. xii. 26. Stromness Harbour to Larsen Point, South Georgia, 122–136 m. 1 specimen.
St. 175. 2. iii. 27. Bransfield Strait, South Shetlands, 200 m. 5 specimens.
St. 177. 5. iii. 27. 27 miles SW of Deception Island, South Shetlands, 1080 m. 2 specimens.
St. 190. 24. iii. 27. Bismarck Strait, Palmer Archipelago, 93–130 m. 1 specimen.
St. WS 33. 21. xii. 26. 54° 59′ S, 35° 24′ W, South Georgia, 130 m. 2 specimens.

These specimens are in exact agreement with the description and figures given by Hertz (the latter unfortunately not being very clear). I quite agree with Dr Hertz that this form is closely related to *A. angularis*, Lyman, as also to *A. algida*, Koehler, which Hertz suggests might better be regarded as a subspecies of *A. angularis*.

I find this form to be *viviparous and hermaphrodite*. There appears to be only one gonad on each side of the genital slits, the one placed adradially being male, the one on the interradial side female. The gonads themselves are not hermaphrodite. There is one young at a time in a bursa, and I have found only one young at each ray.

The subspecies was hitherto known only from the Antarctic coast (the Gauss Station, 380 m.); its discovery in the region South Georgia—South Shetlands—Palmer Archipelago shows that it must be widely distributed in the Antarctic region.

Amphiura grandisquama, Lyman

Amphiura grandisquama, Lyman, 1869. *Prelim. Report on the Ophiuridae and Astrophytidae dredged in deep water between Cuba and the Florida Reef.* Bull. Mus. Comp. Zool., I, 10, p. 334.

A. longispina, Koehler, 1898. *Echinides et Ophiures de l'"Hirondelle'.* Camp. Sci. Monaco, XII, p. 52, pl. ix, figs. 45–6.

A. grandisquama, Mortensen, 1933. *Echinoderms of St Helena (other than Crinoids).* Papers from Dr Th. Mortensen's Pacific Exped., 1914–16, LXVI (Vid. Medd. Dansk Naturh. Foren., 93), p. 451.

For other literary references see the last paper quoted.

St. 399. 18. v. 30. Off Gough Island, 102–141 m. 6 specimens.

The specimens are all quite small; but I do not think there can be any doubt that they belong to *A. grandisquama*.

Since the species was known from St Helena and from off the Natal coast, its occurrence at Gough Island was to be expected.

Amphiura grandisquama, var. guineensis, n.var.

Amphiura grandisquama, Koehler, 1914. Meeresfauna Westafrikas. Echinoderma, p. 190.

St. 283. 14. viii. 27. Off Annobon, Gulf of Guinea, 18–30 m. Several specimens in poor condition.

Koehler has identified directly as *A. grandisquama* some specimens from Île de Rolas, Gulf of Guinea, stating that "ils ne différaient en rien" from specimens from the West Indies or the Bay of Biscay. I find, however, that the present specimens differ from

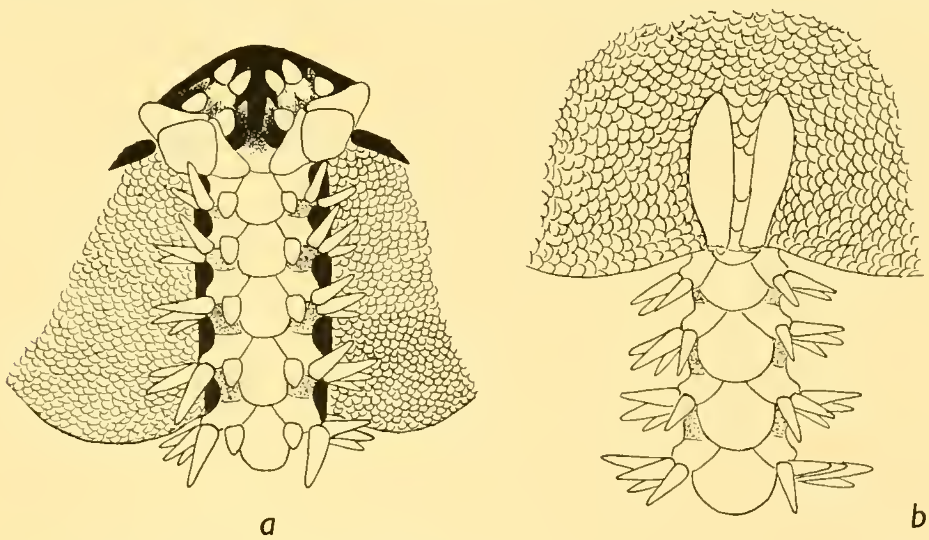


Fig. 10. *Amphiura grandisquama*, var. *guineensis*, n.var. Part of oral side (*a*) and dorsal side (*b*). ×24.

typical *A. grandisquama* in having much finer disk scales, in having often six arm spines on the proximal joints, and in the outer mouth papilla being in general more rounded, scale-like. Also the ventral arm plates are somewhat different from those of typical *grandisquama* (compare fig. 10 with fig. 19 of my Echinoderms of St Helena). Further, the interradii bulge conspicuously outwards between the arms. The spines show more or less distinct traces of brownish colour in their basal part.

With these characteristics it seems necessary to regard these specimens at least as a distinct variety of *A. grandisquama*. That the specimens from Île de Rolas will prove to belong to this same variety may well be suggested.

None of the specimens exceed a size of 5 mm. in diameter of disk, with an arm length of *ca.* 25 mm.

Amphiura microplax, n.sp.

St. 27. 15. iii. 26. West Cumberland Bay, South Georgia, 110 m. 3 specimens.
St. 144. 5. i. 27. Off mouth of Stromness Harbour, South Georgia, 155–178 m. 5 specimens.
St. WS 33. 21. xii. 26. 54° 59′ S, 35° 24′ W, South Georgia, 130 m. 1 specimen.
St. MS 68. 2. iii. 26. East Cumberland Bay, South Georgia, 247 m. 6 specimens.

Diameter of disk apparently not surpassing *ca.* 5 mm. Arms short, four to five times the diameter of disk. Outline of disk pentagonal, the edge of the interradii straight or only slightly notched.

Dorsal side of disk covered with moderate-sized scales, among which the six primary plates are usually distinct. The radial shields are short, narrow, separated only by a

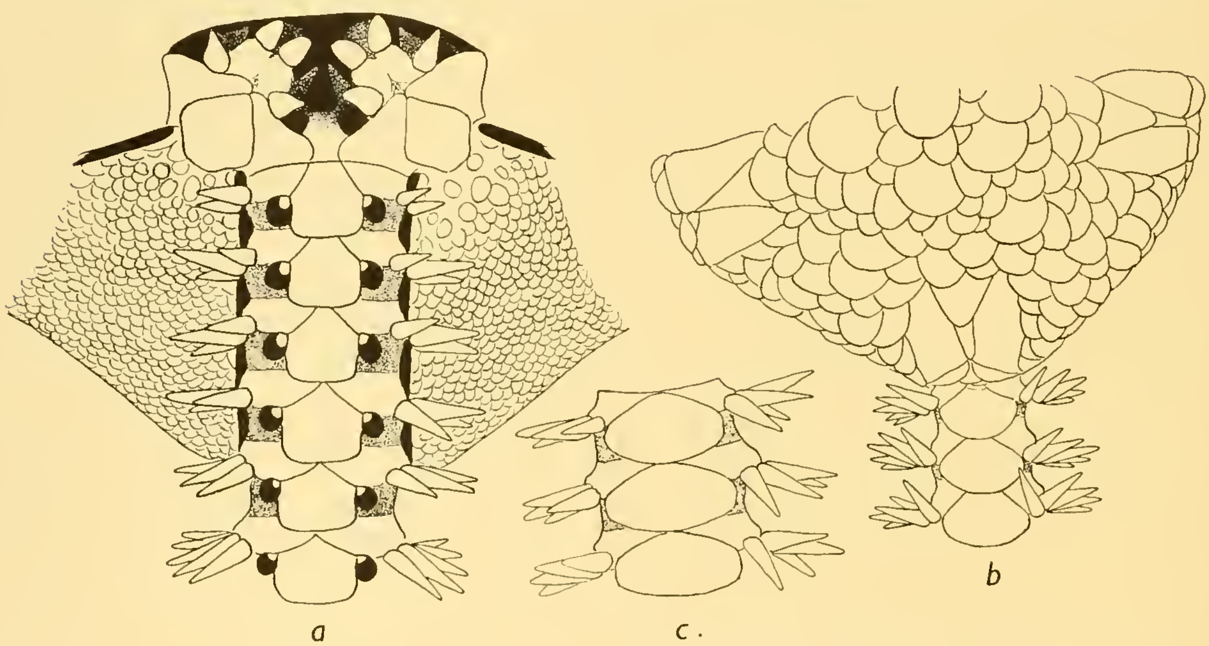


Fig. 11. *Amphiura microplax*, n.sp. Part of oral side (*a*) and dorsal side (*b*). Part of dorsal side of arm joints 3–5 (*c*). Fig. *b* drawn from a smaller specimen than that from which Figs. *a* and *c* are drawn. ×24.

narrow wedge of scales. Ventral interradii covered with very small scales, which may leave the proximal part slightly bare or cover it completely. Buccal shields rather narrow, with an acute inner angle and a rounded outer lobe. Adoral shields triangular, narrowly or scarcely joining within. Outer mouth papilla conical, pointed; infradental papillae rather small, oval. First ventral plate of medium size, broadly contiguous with the second; the following ones more or less broadly contiguous. The ventral plates in general square, as broad as long, there being, however, some variation in their shape. Dorsal plates contiguous, with convex distal edge, in larger specimens almost biconvex,

distinctly broader than long. Arm spines five on the proximal joints, short, conical. Only one very small tentacle scale. Colour in alcohol whitish.

The specimens from St. MS 68 are stated to have been taken "from the roots of a giant sponge".

This species is viviparous. The development is intra-ovarial, as may be seen with certainty in adult specimens, where the bursa may be distinguished as an empty sac covering the large ovary which is filled with eggs and embryos. There is only one interradially placed gonad to each bursa; some ten eggs may develop at a time in the ovary. I have been unable to trace any male genital products in the gonads, these being purely female in all the specimens, even in young specimens of 2·5–3 mm. in diameter of disk. It thus appears that this species is parthenogenetic, for it is most improbable that there would not be a single male in the whole collection, if the species had separate sexes. But the material is too small to allow me to state definitely that such an extraordinary condition as parthenogenesis occurs normally in this species.

In one of the specimens from St. 27 the parasitic Cirripedian *Ascothorax* was found.

Amphiura microplax is very easily distinguished from the other Antarctic and sub-Antarctic Amphiuras with one tentacle scale: *A. magellanica*, *algida*, and *angularis protecta*. The very characteristic small tentacle scale forms a conspicuous difference from these species which all have a large, elongate tentacle scale. Among other Amphiuras it may perhaps find its nearest relative in *A. adjecta*, Mortensen (Echinoderms of South Africa, p. 355, fig. 62); possibly it is also related to *A. Mülleri*, Marktanner, from off St Paul (Marktanner-Turneretscher, *Beschreibung neuer Ophiuriden und Bemerkungen zu bekannten*. Ann. k. k. Naturhist. Hofmuseums, II, 1887, p. 300, Taf. xiii, figs. 25–6), but the figures of that species are altogether too unsatisfactory for a detailed comparison with other species.

Amphiura microplax, var. disjuncta, n.var.

St. 175. 2. iii. 27. Bransfield Strait, South Shetlands, 200 m. 1 specimen.

St. 363. 26. ii. 30. Off Zavodovski Island, South Sandwich Islands, 329–278 m. Several specimens.

St. 366. 6. iii. 30. 4 cables S of Cook Island, South Sandwich Islands, 155–322 m. 1 specimen.

These specimens bear so much general resemblance to *A. microplax* that one might be tempted to regard them as identical. They differ, however, from typical *microplax* in having separate sexes and, probably, in not being viviparous. In the adult male specimens the gonads are remarkably strongly developed and of a peculiar composite shape, recalling an ovary with a number of large eggs. I do not remember having ever seen an Ophiurid with such "composite" testes.

The eggs are rather large and yolky, not ripening all at a time, so that they must be shed from time to time as they become ripe.

Referring to the figures it will suffice to point out the points of difference from the typical *microplax*. The outer mouth papilla is smaller, more scale-like. The dorsal arm plates are usually not contiguous—but this is not a constant character; one may even

find in the same specimen one arm having the dorsal plates contiguous, and another with them non-contiguous. The radial shields are, on the whole, narrower and more elongate than in typical *microplax*, and the scaling of the disk less smooth. There are generally only four arm spines, also on the proximal joints, but sometimes there are five. Size and arm length is as in typical *microplax*.

The tentacle scale may be wanting on some joints, particularly in the distal part of the arms; in the young specimens they are generally lacking completely. Rarely there may be two scales at a single pore.

These structural differences are of only small importance, and, as stated above, were it only for these characters, there would scarcely be sufficient reason for keeping them

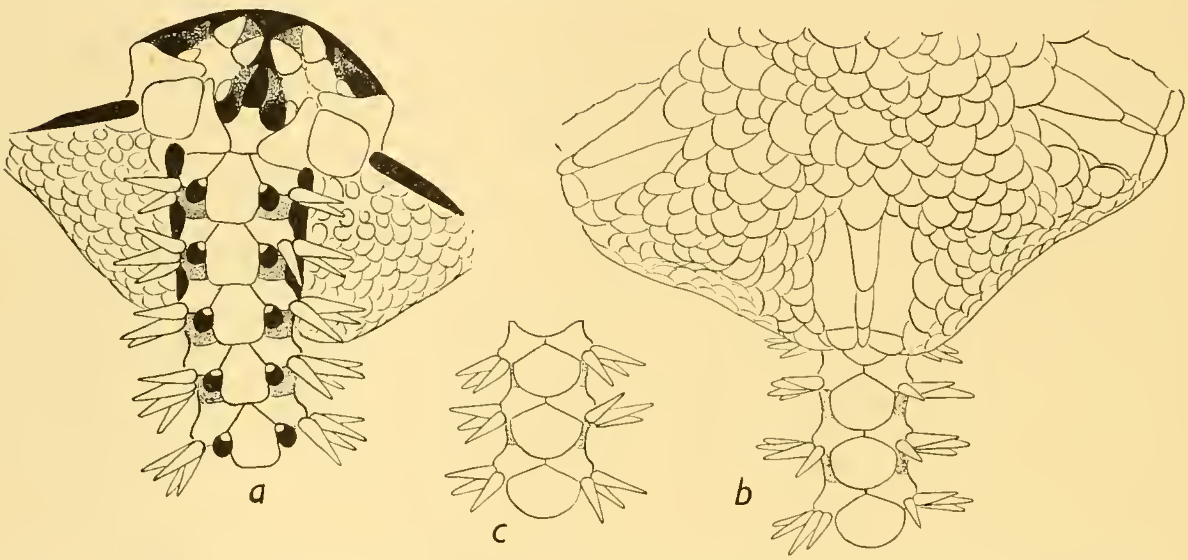


Fig. 12. *Amphiura microplax*, var. *disjuncta*, n.var. Part of oral side (*a*) and dorsal side (*b*). Dorsal side of arm joints from the middle of the arm (*c*). *a*, ×25; *b* and *c*, ×20. *b*, *c*, drawn from a larger specimen than that from which Fig. *a* was drawn.

separate from typical *microplax*. But the fact that the latter is viviparous and apparently parthenogenetic—no males having been found—whereas the present form has separate sexes—the males being particularly conspicuous—and is probably non-viviparous, necessitates keeping it as a distinct form, though very closely related to *A. microplax*. It seems to be the best course to designate it not as a separate species, but as a variety or subspecies of *microplax*.

Several of the gonads, particularly the large male gonads are found to be infested with a Nematode, lying coiled up within the gonad.

Amphiura monorima, n.sp.

St. 27. 15. iii. 26. West Cumberland Bay, South Georgia, 110 m. Several specimens.
St. 39. 25. iii. 26. East Cumberland Bay, South Georgia, 179–235 m. 1 specimen.
St. 42. 1. iv. 26. Off mouth of Cumberland Bay, South Georgia, 102–204 m. 4 specimens.
St. 123. 15. xii. 26. Off mouth of Cumberland Bay, South Georgia, 250 m. 3 specimens.
St. 140. 23. xii. 26. Stromness Harbour to Larsen Point, South Georgia, 122–136 m. 8 specimens.

St. 144. 5. i. 27. Off mouth of Stromness Harbour, South Georgia, 155–178 m. 12 specimens.
St. 148. 9. i. 27. Off Cape Saunders, South Georgia, 132–148 m. 1 specimen.
St. 149. 10. i. 27. Mouth of Cumberland Bay, South Georgia, 200–234 m. 2 specimens.
St. WS 27. 19. xii. 26. 53° 55′ S, 38° 01′ W, South Georgia, 107 m. 2 specimens.
St. WS 33. 21. xii. 26. 54° 59′ S, 35° 24′ W, South Georgia, 130 m. *ca.* 20 specimens.
St. MS 71. 9. iii. 26. East Cumberland Bay, South Georgia, 110–60 m. 2 specimens.

Diameter of disk apparently not surpassing *ca.* 5 mm.; arms short, not more than four to five times the diameter of disk. Circumference of disk round.

Dorsal side of disk with rather large, irregular scales, the largest at the centre; primary plates not distinct. Radial shields short, rather broad, widely diverging, sometimes contiguous distally. Ventral interradii wholly covered with rather large scales; the proximal part of the interradii in the adult usually more or less swollen (on account of

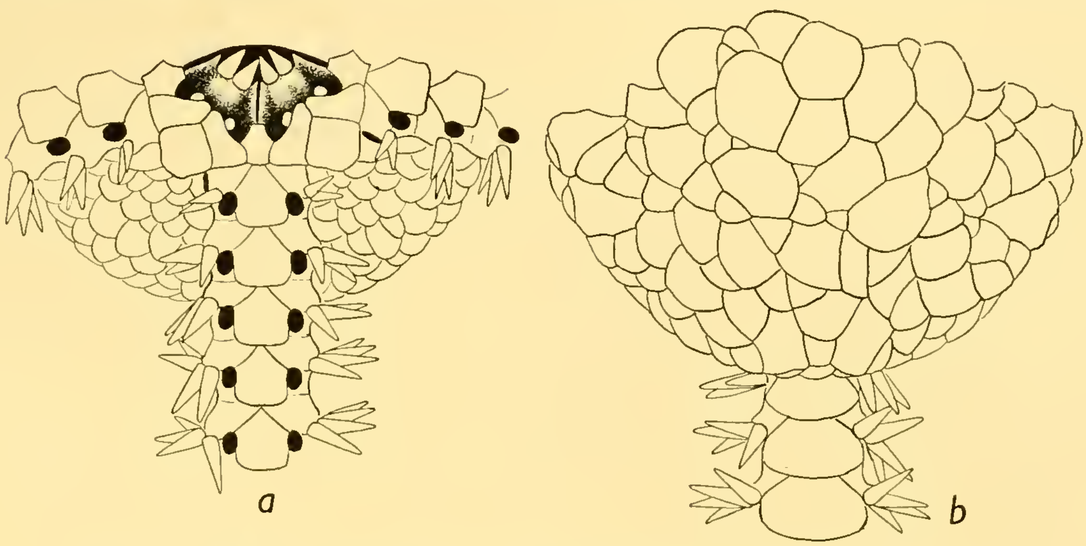


Fig. 13. *Amphiura monorima*, n.sp. Part of oral side (*a*) and dorsal side (*b*). ×20.

the sexual products). Buccal shields with a rather sharp inner angle and a broad truncated outer lobe. Adoral plates joining within, generally broadly so. Outer mouth papilla rounded, very small, sometimes totally wanting, infradental papillae rather pointed, well developed. The pore of the outer mouth tentacle continues inwards in a furrow, produced by the scale of the inner mouth tentacle being somewhat raised. As the jaws are somewhat sunken the part of the mouth frame proximally to the adoral shields is rather conspicuously sunken; round this sunken part the adoral shields, together with the buccal shields and the first ventral plate, form a somewhat raised pentagon, the corners of which are occupied by the buccal shields. The sides of the pentagon are slightly concave.

The first ventral plate is rather large, elongate hexagonal, contiguous with the second plate, which has a truncate inner end. The following ventral plates are merely in contact or slightly separated; they are about as long as broad, with a slightly convex outer edge. The dorsal plates are contiguous, having a truncate inner angle and a slightly convex

outer edge. Arm spines short, conical, four to five at the base of the arm. No tentacle scale. Colour in alcohol greyish white.

This species is viviparous. In the larger specimens I have only exceptionally found the embryos so far developed as to show the first rudiments of the skeleton; but in a smaller specimen I found fully developed young ones, ready to leave the mother. There appear to be generally only one or two embryos at a time in each interradius.

The gonads are hermaphrodite, and there is generally only one gonad in each interradius. There are no normal genital slits, but in specimens with ripe genital products a single, short and very narrow genital slit appears at the adoral end of the interradius, on one side, close to the buccal shield; sometimes there may be two genital slits in one of the interradii, viz. in cases where there are two gonads in the interradius, there is then one slit to each gonad. That the development must be intra-ovarial is clear, since there is no bursa.

The genital slit (the specific name *monorima* refers to the fact that there is usually only one slit in each interradius) is, of course, *not homologous with the normal genital or bursal slits of Ophiuroids*; it is a new formation, corresponding to the pore that develops opposite each ovary in *Ophiopus arcticus* (cf. Mortensen, *Über* Ophiopus arcticus, Zeitschr. wiss. Zool., LVI, 1893) and to the genital pore in *Amphilepis* (cf. Mortensen, Handbook of the Echinoderms of the British Isles, 1927, p. 222; Danish 'Ingolf' Exped., Ophiuroidea, 1933, p. 56).

In this character of its genital slits this species is unique among Amphiurids. In its other characters it seems to be related to *Amphiura tomentosa*, Lyman.

Amphiura Lymani, Studer

Amphiura Lymani, Studer, 1885. *Die Seesterne Süd-Georgiens, nach der Ausbeute d. deutschen Polarstation in* 1882–3. Jahrb. wiss. Anst. Hamburg, II, p. 163, Taf. II, fig. 10 *a–b*.

Amphiodia Lymani, H. L. Clark, 1915. Cat. Recent Ophiurans, p. 250.

St. 45. 6. iv. 26. 2·7 miles S 85° E of Jason Light, South Georgia, 270–238 m. 6 specimens.
St. 141. 29. xii. 26. East Cumberland Bay, South Georgia, 17–27 m. 7 specimens.
St. 145. 7. i. 27. Stromness Harbour, South Georgia, 26–35 m. 2 specimens.
St. WS 33. 21. xii. 26. 54° 59′ S, 35° 24′ W, South Georgia, 130 m. 6 specimens (young).
St. MS 71. 9. iii. 26. East Cumberland Bay, South Georgia, 110–60 m. 1 specimen.

It may seem somewhat bold to maintain that the above specimens, represented in Figs. 14 *a–c*, are identical with Studer's *Amphiura Lymani*, as figured by Studer (*op. cit.*). Judging from Studer's fig. 10 *b* this species would be an *Amphiodia*, to which genus Clark, thus far correctly, referred it. Nevertheless there is no doubt that these specimens are actually *Amphiura Lymani*. Through the kindness of Dr A. Panning of the Hamburg Museum, I have had the type material sent to me for examination. There are in all four specimens, two of which, almost completely destroyed by fungi, are evidently not *Amphiura Lymani*, but probably *Amphiodia affinis*. The two others are in fairly usable condition, the better of them being, however, again an *Amphiodia affinis*. Thus only the fourth specimen remains as the type of *Amphiura Lymani*, and although

in poor condition, it can be recognized as being the specimen described and figured by Studer under this name. The figure of the dorsal side, in particular, shows to some degree the actual character of the specimen (though his statement that the scales of the dorsal side are "feingekörnt" is a mistake, probably referring to the usual structure of these scales as seen under a fairly high magnification).

The representation of the mouth papillae in Studer's fig. 10 *b* is quite misleading. There are *not* three mouth papillae as shown there; it appears to be the mouth tentacle which Studer has mistaken for a papilla. Actually there are only two mouth papillae, as typical of *Amphiura* (Fig. 14 *a*, *b*), and accordingly the species is a true *Amphiura*. The shape of the ventral plates, etc. is very poorly shown in Studer's figure; they are as shown in Fig. 14 *a*, *b*.

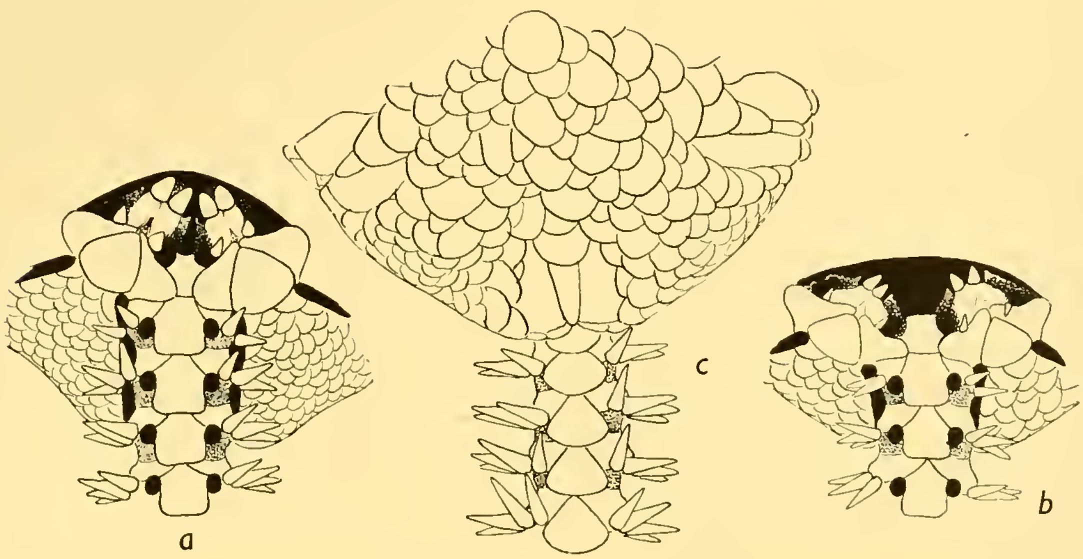


Fig. 14. *Amphiura Lymani*, Studer. Part of oral side of two different specimens (*a*, *b*); part of dorsal side (*c*). $\times 22{\cdot}5$.

This species recalls Lyman's *Amphiura tomentosa* from Kerguelen. I had, indeed, at first identified these specimens as *A. tomentosa*, it being impossible to realize from Studer's description and figures that they could be identical with his *A. Lymani*. Having now seen the type-specimen of *A. tomentosa* in the British Museum I may add here some information about this species. The ventral interradii are half naked; pl. xxix, fig. 10 of the Challenger Ophiuroidea, which shows the ventral interradii scale-covered, is thus erroneous (though fig. 11 shows the plates of the dorsal side of the disk correctly). Primary plates are not distinguishable. The buccal plates are rounded rhombic, not triangular as shown in pl. xxix, fig. 10; the outer mouth papilla is rather broad, but pointed, not scale-like as shown in the figure, which is on the whole poor and unreliable.

It may be suggested that the specimens from the South Orkneys ('Scotia') referred by Koehler (1908, Scott. Nat. Antarctic Exped., Astéries, Ophiures et Echinides, p. 607) to *A. tomentosa* are also in reality *A. Lymani*.

This species is viviparous, and it seems almost certain that the development is *intra-ovarial*. Further, it seems beyond doubt that this species has *separate sexes*; at least, I have found the various specimens opened to have either purely male or purely female gonads (there is only one gonad, more rarely two at the interradial side of the genital slit).

Some of the specimens from St. WS 33 look rather peculiar on account of their being preserved with the mouth widely open, the papilla of the inner mouth tentacle thus becoming very prominent; its edge may also be more or less distinctly serrate (Fig. 14*b*). As these specimens do not show other special characteristics I do not hesitate to refer them also to *A. Lymani*.

Amphiura deficiens, Koehler

Amphiura deficiens, Koehler, 1922. Austral. Antarct. Exped. Echinod. Ophiuroidea, p. 28, pl. lxxx, figs. 1–4.

A. tomentosa deficiens, Hertz, 1926. Deutsche Südpolar-Exped. Ophiuroiden, p. 31.

St. 160. 7. ii. 27. Near Shag Rocks, South Georgia, 177 m. 2 specimens.
St. 170. 23. ii. 27. Off Cape Bowles, Clarence Island, 342 m. 4 specimens.
St. 175. 2. iii. 27. Bransfield Strait, South Shetlands, 200 m. 5 specimens.
St. WS 33. 21. xii. 26. 54° 59′ S, 35° 24′ W, South Georgia, 130 m. 5 specimens.

These specimens are in good agreement with the description and figures given by Koehler. The figures are, however, not clear enough to show the details distinctly

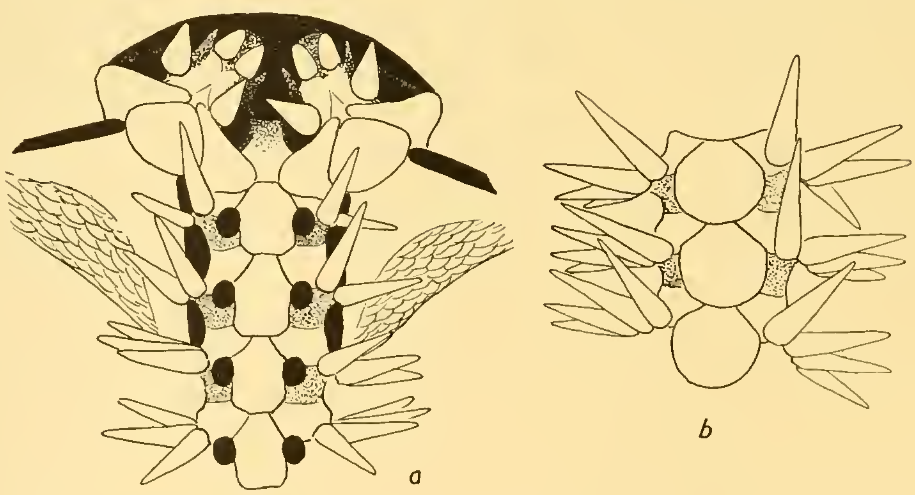


Fig. 15. *Amphiura deficiens*, Koehler. Part of oral side (*a*); dorsal side of arm, from the proximal part (*b*). ×25.

and I have thus thought it desirable to give a couple of drawings to show the shape of the plates more clearly.

It may be pointed out that most of the specimens have the proximal half of the ventral interradius naked, but in other specimens the scales continue almost to the edge of the buccal plates.

This species is *viviparous*; there is only one gonad at each bursal slit, placed on the interradial side. I regret to have forgotten to notice the character of the gonads, whether

hermaphrodite or female only, and the specimens having been dried, it is now too late to ascertain it.

No doubt the species is closely related to *A. tomentosa*, Lyman, as Koehler has noticed; but I think it preferable to retain it as a separate species, not to regard it merely as a subspecies of *tomentosa*, as does Hertz—the more so as our knowledge of the typical *tomentosa* is not very satisfactory.

Amphiura dilatata, subsp. Gaussi, Hertz

Amphiura dilatata, subsp. *Gaussi*, Hertz. 1926. Deutsche Südpolar-Exped. Ophiuroiden, p. 32, Taf. vi, figs. 5–6.

St. 27. 15. iii. 26. West Cumberland Bay, South Georgia, 110 m. 1 specimen.
St. 42. 1. iv. 26. Off mouth of Cumberland Bay, South Georgia, 120–204 m. 2 specimens.
St. 45. 6. iv. 26. 2·7 miles S 85° E of Jason Light, South Georgia, 238–270 m. 4 specimens.
St. 144. 5. i. 27. Off mouth of Stromness Harbour, South Georgia, 155–178 m. 4 specimens.
St. 148. 9. i. 27. Off Cape Saunders, South Georgia, 132–148 m. 1 specimen.
St. 152. 17. i. 27. 53° 51′ S, 36° 18′ W, South Georgia, 245 m. 1 specimen.
St. WS 33. 21. xii. 26. 54° 59′ S, 35° 24′ W, South Georgia, 130 m. 2 specimens.

These specimens in general agree very closely with Hertz' *A. dilatata*, subsp. *Gaussi*, of which I have had a pair of cotypes for comparison. It may be mentioned that small primary plates are sometimes distinct on the disk—the scales being on the whole scarcely as fine as in the type—and that the shape of the buccal shields varies to some degree, from rounded triangular, as shown in Hertz' text-fig. 10, p. 32, to more elongate, with a rounded outer lobe. The arm spines usually reach high up on the dorsal side, leaving—particularly in the proximal part of the arm—only a rather narrow median space free.

Probably these differences indicate that these specimens represent a local variety, but for the present there seems to be no reason for giving it a separate name. This subspecies, like the typical *dilatata*, Lyman (or rather *atlantica*, Ljungman), is *not* viviparous, and it has separate sexes. The gonads, when filled with ripe sexual products, are large and very distinctly seen through the thin, naked skin of the ventral interradii; often the skin has ruptured on preservation, the gonads protruding through the ruptures. The eggs are rather small and numerous, indicating that this species may not improbably have a pelagic larva of the *Ophiopluteus* type.

The specimen from St. 27 is regenerating the disk, which, as in other Amphiuras with naked ventral interradia (e.g. the North Atlantic *Amphiura filiformis*), is liable to be lost.

Amphiura Joubini, Koehler

? *Amphiura polita*, Koehler, 1901. Result. Voyage 'Belgica'. Echinides et Ophiures, p. 29, pl. vii, figs. 49–50; viii, fig. 51.

Amphiura Joubini, Koehler, 1912. IIᵉ Expéd. Antarct. Française. Echinodermes, p. 132, pl. xi, figs. 9, 13.

A. Joubini, Mortensen, 1925. *On a small collection of Echinoderms from the Antarctic Sea.* Arkiv för Zoologi, XVII, A, 31, p. 2.

A. Joubini, Grieg, 1929. *Some Echinoderms from the South Shetlands.* Bergens Mus. Årbok, 1929, 3, p. 7.

St. 175. 2. iii. 27. Bransfield Strait, South Shetlands, 200 m. 2 specimens.
St. 177. 5. iii. 27. 27 miles SW of Deception Island, South Shetlands, 1080 m. 1 specimen.
St. 180. 11. iii. 27. Schollaert Channel, Palmer Archipelago, 160 m. 15 specimens.
St. 181. 12. iii. 27. Schollaert Channel, Palmer Archipelago, 160–335 m. Several specimens.
St. 182. 14. iii. 27. Schollaert Channel, Palmer Archipelago, 278–500 m. Several specimens, partly very young.
St. 186. 16. iii. 27. Fournier Bay, Anvers Island, Palmer Archipelago, 295 m. 3 specimens.
St. 187. 18. iii. 27. Neumayr Channel, Palmer Archipelago, 259–354 m. 1 specimen.
St. 190. 24. iii. 27. Bismarck Strait, Palmer Archipelago, 315 m. 1 specimen.
St. 195. 30. iii. 27. Admiralty Bay, King George Island, Palmer Archipelago, 391 m. 4 specimens.

These specimens are, on the whole, in full agreement with the excellent description and figures given by Koehler (*op. cit.*). It may be pointed out that there are sometimes only five spines at the base of the arms, instead of the usual six or seven. A very noteworthy fact is that some of the spines on the part of the arms enclosed within the disk not infrequently terminate in two diverging, hyaline hooks (Fig. 17 *a*), instead of the usual single, inwardly pointing hook. This hook is not confined to the part of the arm enclosed within the disk, as Koehler states, but may continue almost to the middle of the arm, only it is much less conspicuous farther out on the arm, and is turned outwards. The spines are on the whole very smooth.

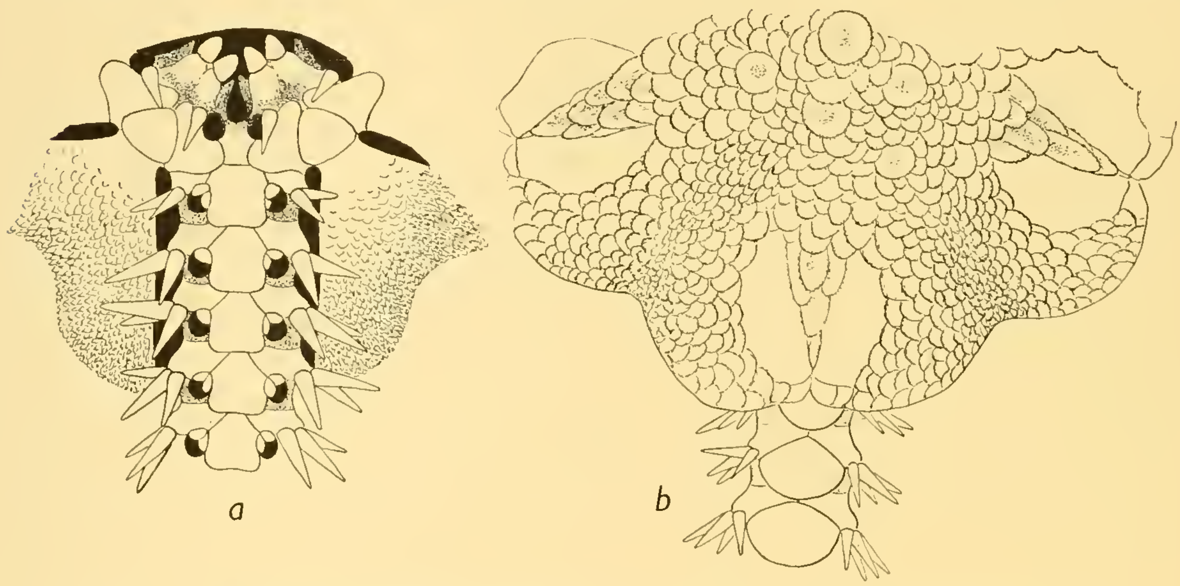


Fig. 16. *Amphiura Joubini*, Koehler, young. Part of oral side (*a*) and dorsal side (*b*). ×18.

Young specimens have a very characteristic appearance, due to the fact that the edge of the disk-scales is somewhat thickened and very finely thorny, one might say ciliated (Fig. 16 *b*); also the primary plates are distinct, though small, whereas they are indiscernible in the adult. As these young specimens also have the main part of the ventral interradii naked and have generally only one tentacle scale, or even none at all, and only four spines, without distinct hooks, they differ so strikingly from the adult that one would be inclined to regard them as a separate species. There are, however, all possible transitions, according to size, from the young to the adult specimens, so that it is per-

fectly evident that they are all one and the same species: in particular the peculiar ciliated appearance of the scales affords an excellent character for identifying the younger specimens.

The buccal shields are rather variable in shape; in the younger specimens they are in general rounded triangular, whereas in the larger specimens they may be somewhat more elongate.

The species has separate sexes and is not viviparous.

I think it quite probable that *A. Joubini* is in reality identical with the *A. polita* described by Koehler in his work on the Echinoids and Ophiurids of the 'Belgica'. Having recently had an opportunity of examining one of Koehler's types in the Brussels Museum, I find that the character of the thorny spines (pl. vii, fig. 50) is not reliable, the spines being sometimes quite smooth. Further, the proximal spines are partly curved inwards, as is typical of *A. Joubini*. The tentacle scales are incorrectly represented in Koehler's pl. vii, fig. 49; they are as in *Joubini* (Fig. 16 *a*). Also the buccal shields are like those of *Joubini*, with straight outer edge. On the whole, I have hardly any doubt but that a direct comparison will show definitely that the two species are identical; the name *Joubini* will then have to give way to the name *polita*, as the older of the two.

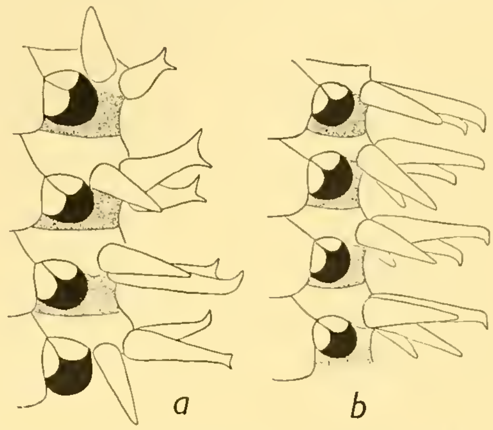


Fig. 17. Part of arm of *Amphiura Joubini*, Koehler, showing character of arm spines: *a*, joints 1–4; *b*, from middle of arm. ×15.

Amphiura Belgicae, Koehler

Amphiura Belgicae, Koehler, 1901. Result. Voyage 'Belgica'. Echinides et Ophiures, p. 27, pl. vii, figs. 46–8.

A. Mortenseni, Koehler, 1908. Scott. Nat. Antarct. Exped. Astéries, Ophiures et Echinides, p. 604, pl. xiv, figs. 121–2.

A. Mortenseni, Koehler, 1912. II^e Expéd. Antarct. Française. Echinodermes, p. 134, pl. xii, fig. 2.

A. Mortenseni, Koehler, 1922. Austral. Antarct. Exped. Echinod. Ophiuroidea, p. 31, pl. lxxx, figs. 5–8.

A. Mortenseni, Koehler, 1923. Swedish Antarct. Exped. Astéries et Ophiures, p. 112.

A. alternans, Koehler, 1923. *Ibid.*, p. 107, pl. xv, figs. 1–4.

A. Eugeniae Mortenseni, Hertz, 1926. Deutsche Südpolar-Exped. Ophiuroiden, p. 29.

A. Eugeniae gracilis, Hertz, 1926. *Ibid.*, p. 30.

A. Mortenseni, Grieg, 1929. *Echinodermata from the Palmer Archipelago.* Sci. Res. Norwegian Antarct. Exped., 1927–9, II, p. 11.

A. Belgicae, Grieg, 1929. *Some Echinoderms from the South Shetlands.* Bergens Mus. Årbok, 1929, III, p. 6.

St. 27. 15. iii. 26. West Cumberland Bay, South Georgia, 110 m. Several specimens.
St. 39. 25. iii. 26. East Cumberland Bay, South Georgia, 179–235 m. 6 specimens.
St. 42. 1. iv. 26. Off mouth of Cumberland Bay, South Georgia, 120–240 m. 12 specimens.
St. 140. 23. xii. 26. Stromness Harbour to Larsen Point, South Georgia, 122–136 m. 5 specimens.

St. 144. 5. i. 27. Off mouth of Stromness Harbour, South Georgia, 155–178 m. 4 specimens.
St. 148. 9. i. 27. Off Cape Saunders, South Georgia, 132–148 m. 1 specimen.
St. 152. 17. i. 27. 53° 51′ S, 36° 18′ W, South Georgia, 245 m. 1 specimen.
St. 156. 20. i. 27. 53° 51′ S, 36° 21′ W, South Georgia, 200–236 m. 7 specimens.
St. 159. 21. i. 27. 53° 52′ S, 36° 08′ W, South Georgia, 160 m. 2 specimens.
St. 160. 7. ii. 27. Near Shag Rocks, South Georgia, 177 m. 3 specimens.
St. 167. 20. ii. 27. Off Signy Island, South Orkneys, 244–344 m. 4 specimens.
St. 170. 23. ii. 27. Off Cape Bowles, Clarence Island, 342 m. 7 specimens.
St. 175. 2. iii. 27. Bransfield Strait, South Shetlands, 200 m. 1 specimen.
St. 190. 24. iii. 27. Bismarck Strait, Palmer Archipelago, 93–130 m. 1 specimen.
St. 363. 26. ii. 30. 2·5 miles S 80° E of Zavodovski Island, South Sandwich Islands, 329–278 m. 1 specimen.
St. WS 27. 19. xii. 26. 53° 55′ S, 38° 01′ W, South Georgia, 107 m. 5 specimens.
St. WS 33. 21. xii. 26. 54° 59′ S, 35° 24′ W, South Georgia, 130 m. Several specimens.
St. WS 42. 7. i. 27. 54° 42′ S, 36° 47′ W, South Georgia, 198 m. 2 specimens.
St. WS 228. 30. vi. 28. 50° 50′ S, 56° 58′ W, Falkland Islands, 229–236 m. 1 specimen.
St. WS 244. 18. vii. 28. 52° 00′ S, 62° 40′ W, Falkland Islands, 253–247 m. 2 specimens.
St. WS 840. 6. ii. 32. 53° 52′ S, 61° 49′ W, 368–463 m. 3 specimens.
St. MS 14. 17. ii. 25. East Cumberland Bay, South Georgia, 190–110 m. 2 specimens.
St. MS 71. 9. iii. 26. East Cumberland Bay, South Georgia, 110–60 m. Several specimens.

It seems quite certain that Koehler's *A. Mortenseni* is identical with his *A. Belgicae*. In describing the former (*op. cit.*, 1908, pp. 604–5) he evidently forgot *A. Belgicae*, since he does not say a word of how they are to be distinguished from one another, only mentioning that *A. Mortenseni* cannot be confounded with *A. Eugeniae* and *A. Studeri*. In the descriptions of the two species no distinguishing characters are to be found, but the figures would seem to show them to be different. Thus the tentacle scales of *A. Mortenseni* are shown (pl. xiv, fig. 122) in a very curious position, at a right angle to one another; but that this is erroneous has been pointed out by Koehler himself (*op. cit.*, 1922, p. 31). As shown by the photographic figures given there, the tentacle scales are as in *A. Belgicae*. Some slight difference may be found in the shape of the buccal shields; but as shown in pl. 80, figs. 6–8 of Koehler's work of 1922, there is a considerable variation in their shape, so that no reliable distinguishing character can be deduced from them. There are no other differences. Comparison of a couple of co-types of *A. Belgicae*, received from the Brussels Museum, with the published figures of *A. Mortenseni* shows beyond any doubt that they are identical.

In addition the subspecies *gracilis* of *A. Eugeniae*, established by Hertz (Deutsche Südpolar-Exped., Ophiuroiden, p. 30), is in my opinion simply a synonym of *A. Belgicae*. Through the kindness of Professor W. Arndt, of the Berlin Museum, I have had a couple of specimens for examination and find them to agree completely with *A. Belgicae*. As for the character that it has only three arm spines, I find that an arm of a larger specimen lying together with these specimens has actually four spines, so this difference is not reliable.

Further, there can in my opinion be no doubt but that Koehler's *A. alternans* is also identical with *A. Belgicae*. Koehler (*op. cit.*, 1923) points out the great variation in the tentacle scales of *A. alternans*—from one scale almost regularly throughout the arm, to

none, likewise almost regularly throughout. He does not mention the occurrence of two tentacle scales here and there, alternating with one or none; but this is by no means of rare occurrence, and this latter case leads to that of typical *Belgicae* (*Mortenseni*): two scales regularly throughout the arm, excepting on some of the proximal joints. As a matter of fact, we have all transitions from the occurrence of two tentacle scales regularly throughout the arm to one or none, and as the specimens agree completely in all other characters, it is impossible to draw a line between them anywhere; consequently both *Mortenseni* and *alternans* become synonyms of *Belgicae*.

On the whole *A. Belgicae* is perplexing in showing such great variation in regard to the tentacle scales, for the number of these scales, two, one, or none, is otherwise of primary classificatory importance in the genus *Amphiura*. Not that this species is otherwise difficult to recognize. As a matter of fact, apart from the variation in the tentacle scales, its general appearance is quite characteristic: the long, stout, conical spines, almost constantly four in number, the large irregular scales in the centre of the disk, generally without recognizable primary plates, and the rather thick skin obscuring the plates of the mouth frame (this is also pointed out by Lyman as characteristic of *A. tomentosa*); further, the arrangement of the tentacle scales, when there are two of them, is characteristically different from such species as *A. Eugeniae*, as seen in Figs. 18 and 21. As for the young specimens identification is often difficult—but this holds of most Ophiuroids in their young stages.

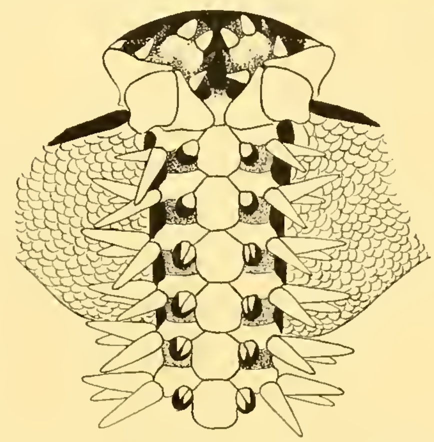


Fig. 18. *Amphiura Belgicae*, Koehler. Part of oral side. ×10.

The specimen from St. 190 is exceptional in having only three arm spines. One specimen from St. WS 27 is unusual in the spines (five) being somewhat flattened and even slightly widened at the point, not conical as is otherwise usual in this species. Both specimens being in all other characters typical, I can only regard them as individual variations of *A. Belgicae*.

Hertz regards *A. Mortenseni* (*Belgicae*) as only a variety of *Eugeniae*. I do not think this correct, as is evident from the description and figures of *A. Eugeniae* given below.

A. Belgicae is viviparous and hermaphrodite. Whether it is protandric I have been unable to settle definitely; it seems rather to be a more complicated case. Whereas in adult specimens it is easy enough to ascertain the hermaphrodite character of the gonads, both eggs and sperms being found within the same gonad (though sometimes only eggs are distinct), it seems as if the gonads in the younger specimens are of separate sexes. In one young specimen, 4 mm. in diameter of disk, I found very distinct male gonads, partly with ripe sperms, besides gonads with young eggs only. Young ones may be found in specimens of only *ca.* 6 mm. diameter of disk; it appears that they lie within the gonads, the development thus being intra-ovarial. The adult specimens also strongly convey this impression. In young specimens there are only one or two embryos in each

gonad, and only one or two gonads to each side of the arm. In adult specimens there are several more, up to about eight to ten eggs in each gonad (I have found no adult specimen with embryos, only with eggs). The eggs are large, rich in yolk; in the young embryonal stages there is a very distinct whitish animal pole and a large, yellowish-brown vegetative pole, which latter in the course of further development is enclosed by the dorsal skin of the embryo. Such embryos have a curious appearance, for the arms look like small, fat sausages, with the skeletal rudiments very small in comparison with the thickness of the arm. A careful study of the development of this species would clearly be remunerative; I have, however, neither the material nor the time to undertake such a study.

One of the specimens (St. WS 33) is infested by a *parasitic Gastropod*; it lies wholly within the body of the Ophiuran, a small opening in one of the ventral interradii showing the place through which the parasite entered. The body of the parasite is wholly sac-shaped, without any trace of its shell left, and it would, indeed, be impossible to tell what kind of animal it was, were it not that it is filled with young embryos with a well-developed, typical Gastropod shell (Fig. 19). These young snails no doubt leave the host by the hole through which the mother entered, and when outside must try to find a new specimen of the brittle-star into which they can penetrate. Probably this parasite belongs to, or is related to, one of the two other sac-shaped, shell-less Gastropods known, *Ctenosculum*, Heath (in *Brisinga*), or *Asterophilus*, Randall and Heath (in *Pedicellaster*).

Fig. 19. Embryo of parasitic Gastropod from *Amphiura Belgicae*. ×42.

Two other specimens are infested by the curious Cirripedian parasite, *Ascothorax*, which looks like a pea, but with a furrow from which protrude two pairs of short limbs. Indeed, it very much recalls an Ostracod. This parasite, like the above-mentioned Gastropod, lies wholly within the body of the brittle-star, but inside a rather heavily plated cyst, opening through a pore in the ventral interradius. (The Gastropod does not lie within a plated cyst.) Neither of the two parasites castrates its host.

The fact that only so very few specimens have been taken off the Falkland Islands (Sts. WS 228, WS 244, and WS 840) indicates that hereabout is the northern limit of the species, it being apparently very rare in this region. (About the identification of these specimens I have no doubt.)

Amphiura da Cunhae, n.sp.

St. 1187. 18. xi. 33. Off Inaccessible Island, Tristan da Cunha, 135–134 m. 8 specimens.

Diameter of disk of largest specimen 3 mm., arms *ca.* 15 mm. long, rather slender. Disk covered with rather coarse scales, among which the primary plates are distinct, particularly so in the younger specimens. The radial shields are short, one-third the length of the disk radius; they are separated by a single wedge of scales, in younger specimens contiguous distally. The ventral interradii are covered by somewhat smaller scales than those of the dorsal side of disk; proximally these scales are more scattered,

the inner part of the interradii being half naked, a feature specially distinct when the interradii are swollen on account of the ripe gonads. In dried specimens this half-naked condition may be less distinct because of the contraction.

Buccal shields spade-shaped, with a small but distinct outer lobe. Adradial shields broad, without or with an outer prolongation separating the buccal shield from the first lateral plate. Outer mouth papilla rather broad, rounded. Ventral plates of the usual form, with straight or slightly concave distal edge; the proximal ones contiguous. Dorsal arm plates rounded fan-shaped, slightly contiguous. Four rather coarse, smooth arm spines; two tentacle scales proximally; farther out, and in the younger specimens, only one or none. Colour of preserved specimens white.

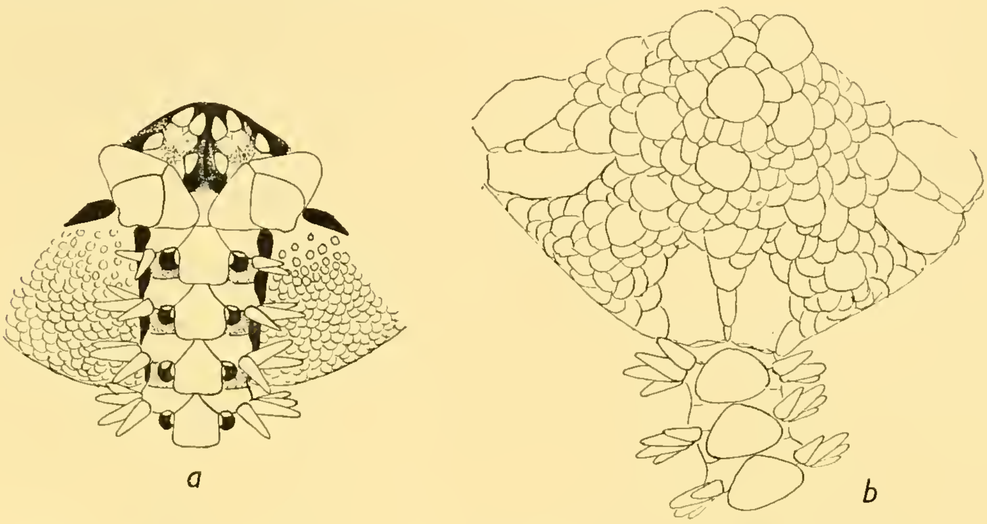


Fig. 20. *Amphiura da Cunhae*, n.sp. Part of oral side (*a*) and dorsal side (*b*). ×22·5.

The species has separate sexes, but the eggs are rather large, so it is not improbable that it will prove to be viviparous. There is only one female gonad at each bursa, placed interradially; two male gonads, likewise at the interradial side of the genital slit.

It seems evident that this species is closely related to the South African *A. albella*, Mortensen, from which it is distinguished mainly by the more scale-covered ventral interradii. Perhaps it should rather be designated only as a variety of the South African species. Because of the very scanty material as yet available of both (only two specimens of *A. albella* are known, from off Durban) I think it preferable to regard them, for the present at least, as two distinct species. The present species seems also to be nearly related to *A. Richardi*, Koehler; but *A. Richardi* is a much larger form, some 10 mm. in diameter of disk, whereas *A. da Cunhae* is full grown (at least fully mature) at a size of 3 mm. diameter.

Amphiura Eugeniae, Ljungman

Amphiura Eugeniae, Ljungman, 1867. *Ophiuroidea viventia huc usque cognita.* Ofvers. K. Vetenskaps-Akad. Förhandl., 1866, p. 318.

A. Eugeniae, Ludwig, 1899. Ophiuroideen Hamburger Magalh. Sammelreise, p. 8.

A. Eugeniae, H. L. Clark, 1915. Cat. Recent Ophiurans, p. 225, pl. iv, figs. 9, 10.

A. Eugeniae, Koehler, 1917. *Echinodermes de Kerguelen.* Ann. Inst. Océanogr., VII, 8, p. 63, pl. viii, figs. 1–9.
A. Eugeniae, Koehler, 1923. Swedish Antarct. Exped., Astéries et Ophiures, p. 110, pl. xiv, fig. 7.
A. Eugeniae, Hertz, 1926. Deutsche Südpolar-Exped. Ophiuroiden, p. 29.

Although this species is not represented in the material collected by the Discovery Committee, I may say some few words about it. The type of *A. Eugeniae* was never figured. Thinking it desirable to have that done, I applied to my friend Professor Sixten Bock of the Stockholm Museum, asking him to lend me the type specimen for this purpose, which he very kindly did. It is in rather poor condition, with all the arms broken off close to the disk; but the disk is sufficiently well preserved to afford a drawing of the oral side, which is given in Fig. 21.

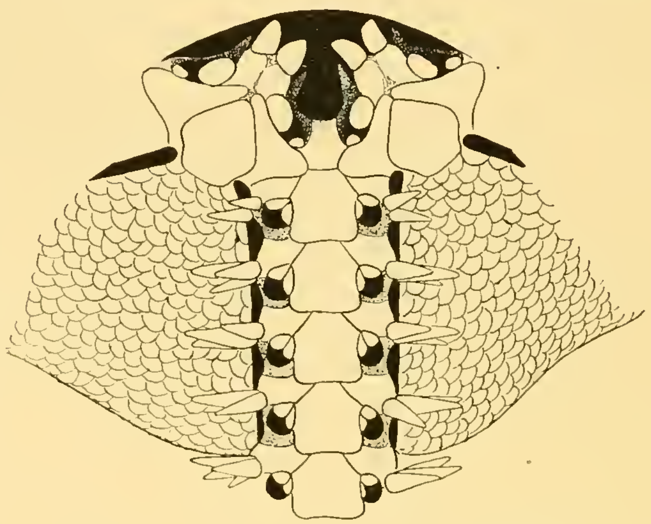


Fig. 21. Part of oral side of *Amphiura Eugeniae*, Ljungman. Type specimen. ×20.

The dorsal side of the disk very closely resembles that shown so excellently in pl. 4, fig. 9, of Clark's Catalogue of the Recent Ophiurans; there is thus no reason to give a special drawing of it. In the figure of the oral side of a specimen from the Swedish Antarctic Expedition given by Koehler (*op. cit.*, 1923, pl. xiv, fig. 7) the shape of the buccal shields is somewhat different from that of the type specimen (Fig. 21), the outer lobe being more distinct. As these specimens from the Swedish Antarctic Expedition (which Professor Sixten Bock has likewise sent me for examination) otherwise closely agree with the type, and as moreover they show some variation in the shape of the buccal shields—some even being exactly as in the type—no weight, of course, can be laid on this slight difference.

The examination of some of the specimens from the Swedish South Polar Expedition shows this species to be *viviparous*. I have found only female gonads, even in young specimens of only 5 mm. diameter of disk; the gonads here were very small, with only one quite young egg. It would seem then that this species is usually *parthenogenetic*.

The fact that the South American specimens all have a small papilla outside the large outer mouth papilla affords a conspicuous difference from the specimens from Kerguelen, which according to Koehler (Echinodermes de Kerguelen, p. 63, pl. viii, figs. 1–9) have constantly only one outer mouth papilla. In his work of 1923 (*op. cit.*, p. 111) Koehler has called attention to this difference and suggests that the Kerguelen form may represent a variety of *A. Eugeniae*, without, however, taking up a definite position on the question. There can, in my opinion, be no doubt that the Kerguelen

form at least represents a distinct variety, if not a distinct species (as is the opinion of H. L. Clark, in his Catalogue of Recent Ophiurans). It might even be maintained that they belong to two different genera, the Kerguelen form being a typical *Amphiura*, whereas *A. Eugeniae*, with two outer mouth papillae, should rather be referred to *Amphiodia*.

It is of importance to ascertain whether the Kerguelen form is viviparous like the typical *Eugeniae*; for if not, it is clearly a distinct species. For the present I prefer to regard it only as a variety of *Eugeniae*, which must then take the name *antarctica*, Studer, of which *Amphiura Studeri*, Lyman, becomes a synonym (cf. H. L. Clark, Cat. Recent Ophiurans, p. 223).

Hertz (Deutsche Südpolar Exped., Ophiuroiden, p. 29) regards *A. Mortenseni*, Koehler (= *A. Belgicae*, Koehler, cf. above, p. 280) as a subspecies only of *A. Eugeniae*. With this I cannot agree. As seen from a comparison of Fig. 21, *A. Eugeniae*, with Fig. 18, *A. Belgicae*, there is a conspicuous difference in the shape of the outer mouth papilla, of the ventral arm plates, and particularly of the tentacle scales, to which is added the important fact that in *A. Belgicae* the gonads are hermaphrodite, which they are not in *A. Eugeniae*. It thus seems quite evident that we have here two distinct species.

Hertz further established a variety *gracilis* of *Eugeniae* (*op. cit.*, p. 30). Through the kindness of Professor W. Arndt of the Berlin Museum I have had a couple of specimens of this variety for examination. I find them to be not at all of the *Eugeniae* type, but very clearly of the *Belgicae* type, as evinced by the shape of the outer mouth papillae, of the tentacle scales, and the large size of the spines. I think this variety is merely a synonym of *A. Belgicae* (cf. above, p. 280).

Amphiura princeps, Koehler

(Plate VII, fig. 10)

Amphiura princeps, Koehler, 1907. *Revision de la collection des Ophiures du Museum d'Hist. nat. Paris*. Bull. Sci. France Belgique, XLI, p. 303, pl. xii, figs. 28–9.

St. WS 89. 7. iv. 27. 9 miles N 21° E of Arenas Point Light, Tierra del Fuego, 23–21 m. 8 specimens.
St. WS 221. 4. vi. 28. 48° 23′ S, 65° 10′ W, 76–91 m. 1 specimen.
St. WS 776. 3. xi. 31. 46° 18′ S, 65° 02′ W, 107–99 m. 1 specimen.
St. WS 847. 9. ii. 32. 50° 16′ S, 67° 57′ W, 51–56 m. 1 specimen.

This species has hitherto only once been recorded, and it is thus very satisfactory that it has been taken by the 'William Scoresby'. The new localities do not markedly extend its geographical range; the species appears to be characteristic of the Magellanic region.

The figures given by Koehler being rather diagrammatic, I have thought it desirable to give some new figures. In reference to Koehler's description I would point out that the scales of the ventral interradii are rather thick, so as almost to give the impression of being granules. The great variation in the shape of the buccal shields is mentioned by Koehler; the heart-shape shown in Koehler's pl. xii, fig. 29, I have not observed, it is

evidently quite unusual; Fig. 22, *a*, *b*, show the more usual form. The second ventral plate is somewhat narrower than the following ones. These plates are slightly broader in the lower part, at the corners opposite the tentacle scales, than at the distal edge. The number of arm spines I find to be more generally six, sometimes only five.

The species has separate sexes, the male gonads being particularly richly developed; they look rather like ovaries filled with eggs, but microscopical examination shows at once their male character. The eggs are rather small and numerous, indicating that the species may have a typical *Ophiopluteus* larva.

There is a rather considerable resemblance between this species and *Amphiura Eugeniae*; but there can be no doubt that they are two quite distinct species. The absence

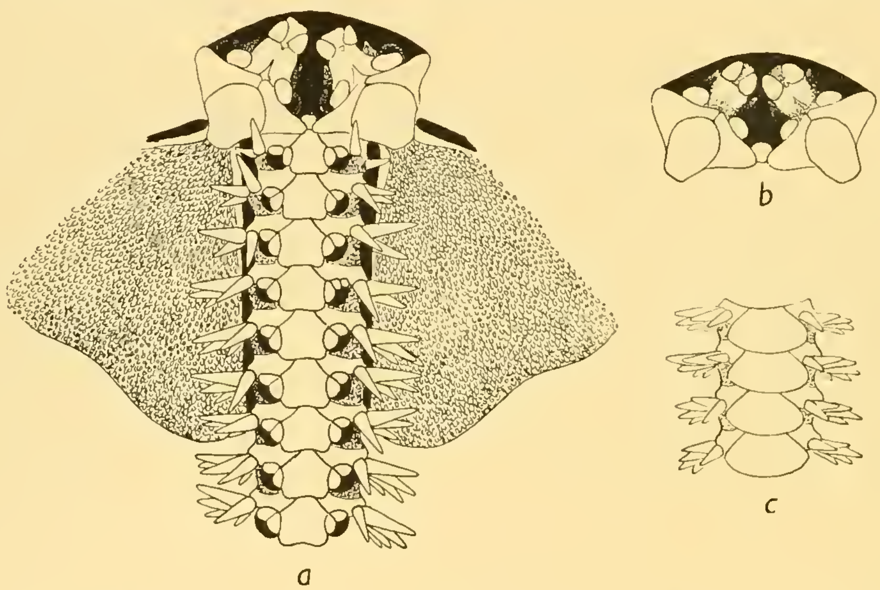


Fig. 22. *Amphiura princeps*, Koehler. Part of oral side (*a*). Mouthparts of another specimen (*b*). Part of arm, dorsal side, joints *ca.* 20–23 (*c*). ×12.

of the small outer mouth papilla, the very small inner ventral plate, and the generally larger number of arm spines in *A. princeps*, distinguish the two species very clearly, besides the fact that *A. Eugeniae* is viviparous and apparently parthenogenetic, whereas *A. princeps* is evidently not viviparous and has separate sexes, the males being of common occurrence.

Amphiura incana, Lyman

Amphiura incana, Lyman, 1882. Sci. Results H.M.S. 'Challenger'. Ophiuroidea, p. 128, pl. xxxiii, figs. 5–7.

A. incana, H. L. Clark, 1923. *Echinoderm Fauna of South Africa.* Ann. S. African Mus., XIII, p. 328.

A. incana, Hertz, 1926. Deutsche Südpolar-Exped. Ophiuroiden, p. 34, Taf. vii, fig. 1.

A. incana, Mortensen, 1933. *Echinoderms of South Africa.* Papers from Dr Th. Mortensen's Pacific Exped., LXV (Vid. Medd. Dansk Naturh. Foren., 93), p. 351.

St. 91. 23. ix. 26. False Bay, South Africa, 35 m. 6 specimens.

St. 283. 14. viii. 27. Annobon, Gulf of Guinea, 18–30 m. 12 specimens.

The finding of this species, hitherto known only from South African seas, in the Gulf of Guinea, is of considerable zoogeographical interest. The specimens from the Gulf of Guinea are quite typical, only somewhat smaller than the South African specimens, none of them exceeding 6 mm. diameter of disk.

Amphiura Chiajei, Forbes

Amphiura Chiajei, Lütken, 1858. Additamenta ad hist. Oph., I, p. 57, Tab. ii, fig. 12 *a*, *b*.
A. Chiajei, Ludwig, 1879. *Die Echinodermen d. Mittelmeeres.* Mitth. Zool. Stat. Neapel, I, p. 550.
A. Chiajei, Koehler, 1921. Faune de France. Echinodermes, p. 78.
A. Chiajei, Mortensen, 1927. Handbook Echinod. Brit. Isles, p. 212.

For the older literature cf. Ludwig, *op. cit.*

St. 274. 4. viii. 27. Off St Paul de Loanda, Angola, 64–65 m. 2 specimens.
St. 279. 10. viii. 27. Off Cape Lopez, French Congo, 58–67 m. 4 adult and several young specimens.

These are quite typical *A. Chiajei*. The species was not hitherto known farther south than the Moroccan coast; but the finding of these specimens off French Congo proves that it occurs probably all along the African Atlantic coasts, at least as far south as French Congo. It is only to be wondered at that it has not hitherto been found there.

The young specimens from St. 279, though not altogether showing the characters of the species clearly (only three arm spines), decidedly belong to this species; I have compared them with specimens of corresponding sizes from the Kattegat, where confusion with other species is excluded, and find them to be identical.

One cannot help being struck by the very great general resemblance between the present specimens and the *Amphiocnida semisquamata* described and figured by Koehler in Michaelsen's Meeresfauna Westafrikas. However, the scales of the present specimens are smooth and thus typical of *Amphiura Chiajei*, and do not end in a point as in *Amphiocnida semisquamata*—or rather *Acrocnida*, as it must be named according to Gislén's revision of these forms in his paper *On the generic types of the Ophiurid genus* Ophiocentrus *Ljungman* (Göteborgs K. Vetensk. Vitterhets-Samhälles Handlingar, IV, Ser. 30, 6, 1926). Further, there is no distinct median keel on the ventral plates as in *Amphiocnida semisquamata*, and the spines are more slender and pointed than in that species; it is thus out of the question that they could be identical. But it seems evident that the genus *Acrocnida* is very closely related to *Amphiura Chiajei*, perhaps derived from the latter, or at least from an *Amphiura* of that type.

Ophiocentrus novae-zelandiae, Gislén

Ophiocnida pilosa, H. L. Clark, 1909. *Echinodermata. Sci. Results Trawling Exped. 'Thetis'.* Mem. Austral. Mus., IV, p. 541.
Amphiocnida pilosa, Mortensen, 1924. *Echinoderms of New Zealand and the Auckland-Campbell Islands.* II, *Ophiuroidea.* Papers from Dr Th. Mortensen's Pacific Exped., XX (Vid. Medd. Dansk Naturh. Foren., 77), p. 154.

Ophiocentrus novae-zelandiae, Gislén, 1926. *On the generic types of the Ophiurid genus* Ophiocentrus *Ljungman* (Amphiocnida *Verrill*). Göteborgs K. Vetensk. Vitterhets-Samhälles Handlingar, xxx, 6, p. 13.

St. 939. 17. viii. 32. 35° 49′ S, 173° 27′ E, Cook Strait, New Zealand, 98 m. 1 young specimen.

Whereas it is clear, as shown by Gislén (*op. cit.*), that the genus *Amphiocnida* of Verrill is identical with Ljungman's genus *Ophiocentrus*, it can hardly be regarded as definitely settled that the New Zealand form is really specifically different from the typical *pilosa*, from the Bass Strait; it is, accordingly, with due reservation that I am here following Gislén in regarding the New Zealand form as a separate species. Comparison with material from the type locality will be needed for deciding the question of the specific validity of the New Zealand form. I rather expect, judging from the great variability existing in the New Zealand form (cf. *op. cit.*, 1924), that they will prove to be all one species.

The present specimen (2 mm. diameter of disk) shows an interesting feature in having two slender spines on the distal edge of the buccal shields. If this proves to be a constant character, the present specimen would represent a species different from those from the Colville Channel described in my paper of 1924, in which no such spines were observed. But I have little doubt that this is merely an individual variation.

Amphiodia affinis (Studer)

Amphiura affinis, Studer, 1885. *Die Seesterne Süd-Georgiens.* Jahrbuch wiss. Anst. Hamburgs, II, p. 162, Taf. ii, fig. 9 *a*, *b*.
Ophioceramis antarctica, Studer, 1885. *Ibid.*, p. 160, Taf. ii, fig. 7 *a*, *b*.
Amphioplus affinis, Koehler, 1917. *Echinodermes de Kerguelen*, Ann. Inst. Océanogr., VII, 8, p. 69, pl. viii, figs. 10, 11.
A. affinis, Koehler, 1923. Swedish Antarct. Exped. Astéries et Ophiures, p. 115.
Amphiactis affinis, Hertz, 1926. Deutsche Südpolar-Exped. Ophiuroiden, p. 27, Taf. vi, fig. 3.

St. 45. 6. iv. 26. 2·7 miles S 85° E of Jason Light, South Georgia, 238–270 m. 1 specimen.
St. 141. 29. xii. 26. E. Cumberland Bay, South Georgia, 17–27 m. 7 specimens.
St. 179. 10. iii. 27. Melchior Island, Schollaert Channel, Palmer Archipelago, 4–10 m. 1 specimen.

To the very careful description of this species given by Koehler (*op. cit.*, 1917), one point of importance should be added, viz. that the genital slits are quite short, not reaching beyond the first arm joint (Fig. 23). I have been able to ascertain this also in the type specimens, Studer's original material having very kindly been lent me for re-examination from the Hamburg Museum. It appears that the tentacle scale is often lacking at the first pore pair.

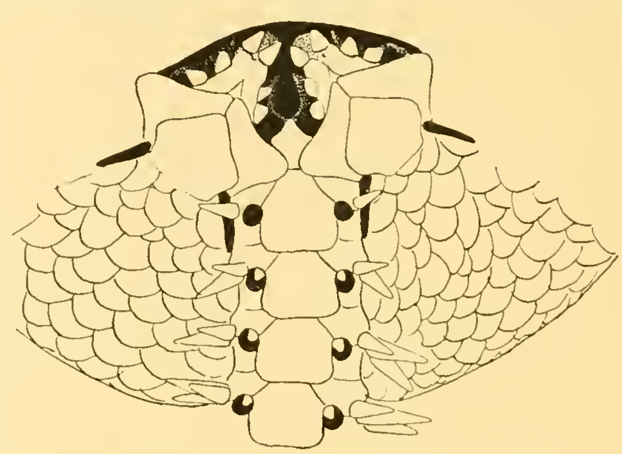


Fig. 23. *Amphiodia affinis* (Studer). Part of oral side. ×20.

It would seem more correct to refer this species to the genus *Amphiodia* than to *Amphioplus* as Koehler has done; as a matter of fact the mouth papillae are in accordance with the *Amphiodia* type (as defined by Matsumoto, Monogr. Japanese Ophiuroids, p. 166), not with the *Amphioplus* type (Fig. 23). To *Amphiactis*, to which genus it is referred by Hertz, it does not seem to me to have any near affinity.

This species is viviparous and hermaphrodite. The gonads themselves are not hermaphrodite, but either of pure female or of pure male character; they are found only at the interradial side of the genital slits (judging from the two specimens opened). It appears that the development is intra-ovarial. There are only one or two eggs (embryos) at a time in each ovary.

There cannot be the slightest doubt that Studer's *Ophioceramis antarctica* is identical with his *Amphiura affinis*. From an inspection of the very poor figures of the two "species" given by Studer (*op. cit.*) it is at once evident that they must be very closely allied, in spite of the fact that Studer referred them to two different genera and families. Suspecting an error here on the part of Studer I applied to my friend Dr A. Panning of the Hamburg Museum for the loan of the type of this *Ophioceramis antarctica*, which he very kindly sent me. My suspicion proved well founded. Not a single character can I find by which to distinguish it from *A. affinis*. The specimen is in rather poor condition, but it is still possible to make out the characters of the species, though the genital slits are not yet distinct (the specimen is a young one, 3 mm. diameter of disk). From the figure given by Studer (fig. 7 *a*) it would appear that the radial shields are quite indistinguishable, in contradistinction to *A. affinis*, the figure of which (fig. 9 *a*) shows the radial shields quite distinctly. But the former figure is incorrect, the radial shields are exactly of the same shape and size as in *A. affinis* of corresponding size. Further, the tentacle scales would seem to afford an important difference, *Ophioceramis antarctica* being stated to have two tentacle scales, "sehr kurz, flach", *A. affinis* to have only one small tentacle scale. In reality *Ophioceramis antarctica* has only one tentacle scale, exactly as in *A. affinis*, and both of Studer's figures, 7 *b* and 9 *b*, show it incorrectly; it is as drawn here in Fig. 23.

The identity of Studer's *Ophioceramis antarctica* and *Amphiura affinis* being thus a fact, the question is which name has to be used for the species. In Studer's paper *Ophioceramis antarctica* comes first; but in 1867 Ljungman described an *Ophiophragmus antarcticus*, which H. L. Clark (Cat. Recent Ophiurans, p. 249) has referred to the genus *Amphiodia*. The identity of Ljungman's *Ophiophragmus antarcticus* with *Amphiodia chilensis* (Müller and Troschel) does not make the species name *antarctica* available for the present species, unless the species *chilensis* is referred to the genus *Ophiophragmus*, which is, however, disputable. I think it therefore the safest course to let the present species keep the name *affinis*, which will be available no matter to which genus, *Amphiodia* or *Amphioplus*, the species is referred.

It is satisfactory that the confusion caused by this *Ophioceramis antarctica* has been cleared up, a species the more mysterious since the genus *Ophioceramis* is otherwise not known outside the tropical region.

I may take the opportunity of pointing out here that one more species has erroneously been referred to the genus *Ophioceramis*, viz. *O. albida* of Ljungman. This was originally described by Ljungman as an *Amphipholis*, but by Lyman transferred to *Ophioceramis*, which is accepted by H. L. Clark. There can in my opinion be no doubt that this species does not belong to any of these genera, but to the genus *Amphioplus*. The teeth in particular are very different from those of the typical *Ophioceramis*—few, simply tongue-shaped in *O. albida*, very numerous and excavated in *Ophioceramis*; also the dorsal arm-plates are quite different—simple in *O. albida*, more or less irregularly divided longitudinally in *Ophioceramis*.

Amphiodia acutispina, Koehler

Amphiodia acutispina, Koehler, 1914. Meeresfauna Westafrikas. Echinoderma, p. 195, pl. vii, figs. 11–14.

St. 279. 10. viii. 27. Off Cape Lopez, French Congo, 58–67 m. 1 specimen.

The single specimen, like those described by Koehler, has lost the disk and the greater part of the arms. But there can be no doubt of its identity with this characteristic species.

Amphiodia ascia,[1] n.sp.

(Plate VII, fig. 11)

St. 272. 30. vii. 27. Off Elephant Bay, Angola, 73–97 m. 2 specimens.

Diameter of disk 5 mm., arms apparently about six to seven times that length. Interradial edges of disk slightly concave.

Disk scales small, imbricating; there is no trace of primary plates, at most a small central plate discernible. Radial shields rather large, about as long as half the disk radius; they are separated in one of the specimens by only a single, narrow wedge of scales, in the other by several more scales. Ventral interradii almost totally naked, only with some few small, widely scattered scales. Buccal shields almost circular, only at the distal edge narrowing so as to form a broad, rounded lobe (Fig. 24 *a*); in the second specimen this outer lobe is a little more distinct. Adoral plates not quite joining within; they have a broad outer lobe, separating the first lateral plate from the buccal shield. Mouth papillae very characteristic: a very small, scale-like one outermost, and then a long, spine-like papilla. Infradental papillae, as well as the papilla of the first mouth tentacle, of the usual shape, but the jaws are unusually high. First ventral plate broad and square. Those following about as broad as long, broadly contiguous in the proximal part, the sides and the distal edge with a slight re-entrant curve; the proximal three to four plates have a rather distinct keel on each side. The dorsal arm-plates are about twice as broad as long, with a rounded inner angle and a convex distal edge. Arm spines six or seven, the lowermost slightly the longest, about the length of an arm-joint, the following gradually smaller, the uppermost one being the smallest.

[1] *Ascia* = a hatchet.

They are slender, pointed, except the second from below from a few joints outside the disk; this spine is broader than the others and terminates in two small hyaline hooks, the spine thus having the shape of a small hatchet. (The species name refers to this character.) No tentacle scale. The specimens (dried) show no trace of particular colour.

This very characteristic species does not seem nearly related to any other known species of the genus *Amphiodia* (or *Amphiura*—to which latter genus it might perhaps equally well be referred, just as well as *Amphiura Eugeniae*).

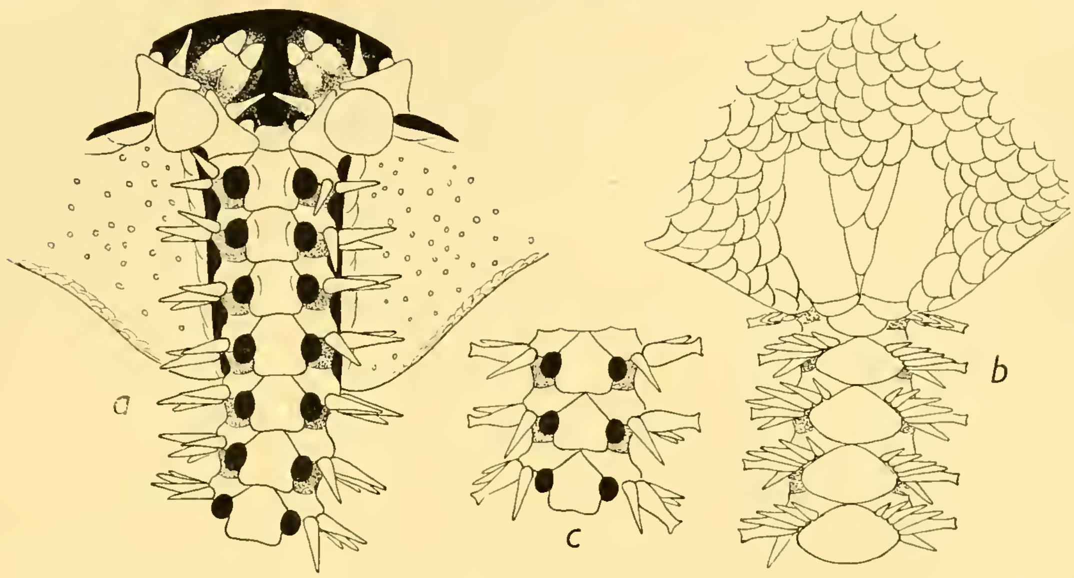


Fig. 24. *Amphiodia ascia*, n.sp. Part of oral side (*a*) and dorsal side (*b*). Arm joints from the middle of arm, oral side (*c*). ×20.

Ophionephthys magellanica, n.sp.

St. WS 742. 5. ix. 31. 38° 22′ S, 73° 41′ W, 35 m. 6 specimens.

These specimens having all lost the disk, no complete description of the species can be given. However, the shape of the mouthparts and the arm plates shows it to be decidedly different from any other species of *Ophionephthys* hitherto described, and since the genus *Ophionephthys* was not hitherto known to occur in the Magellanic region, I have deemed it desirable to name the species, in spite of the incompleteness of the description.

The arms are very long and slender, as usual in this genus; as they are all broken, nothing can be said of their actual length.

There are three rather small, scale-like, outer mouth papillae, much smaller than the infradental papillae. The buccal shields are spade-shaped, with a more or less conspicuous outer lobe; the adoral shields, which join within, have a rather sharp outer (adradial) angle. The hole in the jaws, characteristic of *Ophionephthys*, as well as of *Ophionema*, is sometimes indistinct (Fig. 25 *a*). Ventral arm plates usually distinctly longer than wide, with distal edge slightly concave. Dorsal arm plates fan-shaped,

conspicuously broader than long, narrowly contiguous. Five or four slender, pointed arm spines. Tentacle scales normally two, but irregularly developed, there being often only one scale. Some of the specimens have an indication of light brownish colour.

The lateral plates are rather broad and the peculiar feature that these plates appear double on the dorsal side of the arms, because the edge of the vertebra is seen below the lateral plate, as described by Eigil Nielsen (*Ophiurans from the Gulf of Panama, California, and the Strait of Georgia.* Papers from Dr Th. Mortensen's Pacific Expedition,

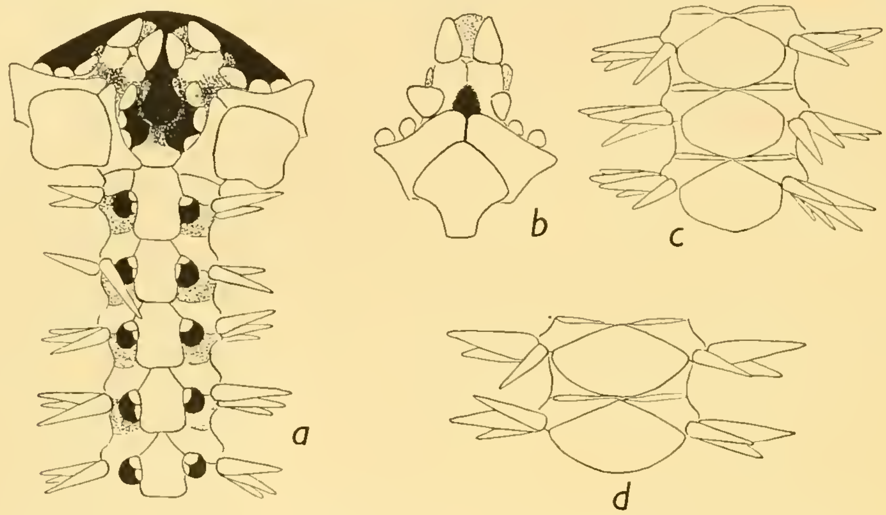


Fig. 25. *Ophionephthys magellanica*, n.sp. Part of oral side (*a*); mouthpart (jaw) of another specimen (*b*). Arm joints, dorsal side; joints 6–8 (*c*), and from middle of arm (*d*). ×20.

LIX, Vid. Medd. Dansk Naturh. Foren., 91, 1932, p. 265, figs. 7–8), is only just indicated here.

This species seems to be related to *Ophionephthys stewartensis*, Mortensen, from Stewart Island (Mortensen, Echinoderms of New Zealand and the Auckland-Campbell Islands. II, Ophiuroidea, p. 159), from which it is, however, very well distinguished by the shape of the buccal shields and the dorsal arm plates.

Amphipholis squamata (Delle Chiaje)

Amphipholis squamata, Ljungman, 1871. *Förteckning öfver uti Vestindien af Dr A. Goës samt under Korvetten Josefinas Expedition i Atlantiska Oceanen samlade Ophiurider.* Öfvers. K. Vetenskaps Akad. Förhandl. Stockholm, 1871, p. 633.

A. patagonica, Ljungman, 1871. *Ibid.*, p. 646.

Amphiura squamata, Koehler, 1908. Scott. Nat. Antarct. Exped. Astéries, Ophiures et Echinides, p. 607.

Amphipholis patagonica, Ludwig, 1898. *Die Ophiuren d. Sammlung Plate.* Zool. Jahrb., Suppl., p. 764.

A. patagonica, Koehler, 1923. Swedish Antarct. Exped. Astéries et Ophiures, p. 113, pl. xiv, figs. 11–12.

A. squamata, Bernasconi, 1926. *Una Ofiura vivipara de Necochea.* An. Mus. Nac. Hist. Nat. Buenos Aires, XXXIV, p. 146, Lam. i–iii.

A. squamata, Mortensen, 1933. Danish 'Ingolf' Exped. Ophiuroidea, p. 63.

St. 4. 30. i. 25. Off Tristan da Cunha, 40–46 m. 1 specimen.
St. 399. 18. v. 30. Off SW point of Gough Island, 102–141 m. 10 specimens.
St. 724. 16. x. 31. Fortescue Bay, Straits of Magellan, 0–5 m. 1 specimen.
St. 941. 20. iii. 32. 40° 53′ S, 174° 47′ E, Cook Strait, New Zealand, 128 m. 2 specimens.
St. 1187. 18. xi. 33. Off Tristan da Cunha, 117–106 m. Several specimens.
St. WS 762. 16. x. 31. 43° 50′ S, 65° 05′ W, 65–67 m. 1 specimen.

I do not see any possibility of distinguishing the *Amphipholis* from the Magellanic region from the cosmopolitan *A. squamata*. Studying the descriptions given of *A. patagonica* I cannot find any other differences pointed out than that the scales of the dorsal side of the disk are somewhat coarser in *A. patagonica*. But in this regard specimens of *A. squamata* vary rather considerably, so that it is impossible to base a specific distinction upon this character. A direct comparison of the fine specimen from the Magellan Strait (St. 724), the type locality of *A. patagonica*, with specimens of *A. squamata* from England or Iceland does not reveal any difference at all. Nobody would be able to distinguish specimens from the Magellanic region from *A. squamata*, if subjected to him for identification without knowing whence they came. The only reasonable course then is to give up a "species" which cannot be distinguished, and acknowledge it as identical with the cosmopolitan *A. squamata*.

Amphipholis nudipora, Koehler

Amphipholis nudipora, Koehler, 1914. Meeresfauna Westafrikas. Echinoderma, p. 193, pl. viii, figs. 15–16.

St. 279. 10. viii. 27. Off Cape Lopez, French Congo, 58–67 m. 3 specimens.

Like the specimens on which Koehler based his description of this species, the present specimens lack the disk, the character of which thus still remains unknown. But the characters of the mouth frame and the arms are quite sufficient for recognizing this very distinct species.

Ophiostigma abnorme (Lyman)

Ophiocnida abnormis, Lyman, 1878. *Ophiurans and Astrophytons. Rep. Dredging Operations of the U.S. Coast Survey Steamer 'Blake'*. Bull. Mus. Comp. Zool., v, 9, p. 227, pl. ii, figs. 37–9.
Ophiostigma africanum, Lyman, 1879. *Ophiuridae and Astrophytidae of H.M.S. 'Challenger'*. Bull. Mus. Comp. Zool., vi, 2, p. 41, pl. xiii, figs. 368–70.
Ophiocnida abnormis, Lyman, 1882. Sci. Results H.M.S. 'Challenger'. Ophiuroidea, p. 155.
Ophiostigma africanum, Lyman, 1882. *Ibid.*, p. 165, pl. xviii, figs. 17–19.
Amphipholis abnormis, Verrill, 1899. *North American Ophiuroidea*. Trans. Conn. Acad., x, p. 316.
Ophiostigma africanum, Koehler, 1909. Echinodermes. Camp. Sci. Monaco, xxxiv, p. 168.
Ophiocnida abnormis, Koehler, 1914. Meeresfauna Westafrikas. Echinoderma, p. 186.
Amphipholis abnormis, H. L. Clark, 1915. Cat. Recent Ophiurans, p. 240.
Ophiostigma africanum, H. L. Clark, 1915. *Ibid.*, p. 243.

St. 1. 16. xi. 25. Clarence Bay, Ascension, 16–27 m. 6 specimens.

I do not see any possibility of distinguishing Lyman's *Ophiostigma africanum* from his *Ophiocnida abnormis*. This may sound rather peculiar, since they are referred to two separate genera; but, as set forth by Verrill (*op. cit.*), the genus *Ophiocnida* as used by

Lyman is a very heterogeneous assemblage, and his *O. abnormis* does not agree with the typical *Ophiocnida*, which is characterized by having three equal-sized mouth papillae, as in *Amphiodia*. The mouth papillae of the species *abnormis* are exactly as in *Amphipholis*, the outer papilla being very broad and flat, and Verrill therefore transferred this species to the genus *Amphipholis*, in which he is followed by H. L. Clark. But exactly the same type of mouth papillae is found also in the genus *Ophiostigma* of Lütken. The question is then how to distinguish between *Amphipholis* and *Ophiostigma*. As a matter of fact, I do not find any other distinction mentioned between them than the existence of spines on the disk in the latter, these being absent in *Amphipholis*. This is a rather unimportant character, and we might thus far maintain *Amphipholis* and *Ophiostigma* to be identical. However, this would lead to the very deplorable result that *Ophiostigma* as the older name would have to supplant the very well known and now generally accepted name *Amphipholis*. I therefore think it necessary to maintain the name *Ophiostigma* for the group of species of the *Amphipholis* type with spines on the disk, just as *Ophiocnida* is kept for the species of the *Amphiodia* type with spines on the disk. Also the peculiar spine-like tentacle-scales appear to form a valuable generic character of *Ophiostigma*.

This species has separate sexes and is apparently not viviparous; I have not seen female gonads, the only two adult specimens, 2·5–3 mm. in diameter of disk, being males, the others not yet having the gonads developed.

The species was not hitherto known from Ascension, but being found in the West Indies and on the African coast, it was to be expected that it would occur there.

Amphioplus acutus, n.sp.

(Plate VIII, fig. 14)

St. 180. 11. iii. 27. Schollaert Channel, Palmer Archipelago, 160 m. 5 specimens.
St. 181. 12. iii. 27. Schollaert Channel, Palmer Archipelago, 160–335 m. Several specimens.
St. 182. 14. iii. 27. Schollaert Channel, Palmer Archipelago, 278–500 m. 4 specimens.
St. 190. 24. iii. 27. Bismarck Strait, Palmer Archipelago, 315 m. 1 specimen.

Diameter of disk up to 9 mm.; arms slender, about seven to eight times the diameter of disk. The outline of the disk is usually pentagonal, the interradial edges straight or at most gently concave.

The disk is covered by rather large, imbricating scales, among which the primary plates are not very distinctly seen. In the interradii the scaling of the underside generally continues some distance on the dorsal side, forming a rather well limited area because the scales here imbricate in the opposite direction to that of the scales of the dorsal side of the disk. The radial shields are narrow, straight, diverging, widely separated in their whole length; they are a little more than one-third the disk radius. The ventral interradii are covered throughout by small, more or less rounded scales, much finer than those of the dorsal side of the disk.

Buccal shields almost quadrangular, with inner and lateral angles almost right, but the distal angle rounded; the sides, particularly the inner ones, straight. The madreporite is usually conspicuous, with an irregular circle of very distinct pores, each on a

slight elevation, the more distinct as its colour is lighter than the general colour of the plate. Adoral plates not prolonged outwards so as to separate the first lateral plate from the buccal shield. The jaws are rather elongate. The mouth papillae are four (five) on each side; the outermost one is small, scale-like, the two following ones long and pointed, spine-like; the infradental papillae are small, sometimes somewhat irregular; also the papilla of the first mouth tentacle may be double.

The first ventral plate is small, with somewhat rounded distal edge; the following ventral plates slightly contiguous, somewhat broader than long, with lightly convex outer edge; the outer corners rather sharp. Dorsal arm plates broader than long, biconvex. Arm spines four, slender, conical, pointed, smooth. Tentacle scales typically two, but the one along the ventral plate often much smaller than the outer scale or totally lacking. Colour in alcohol dark grey.

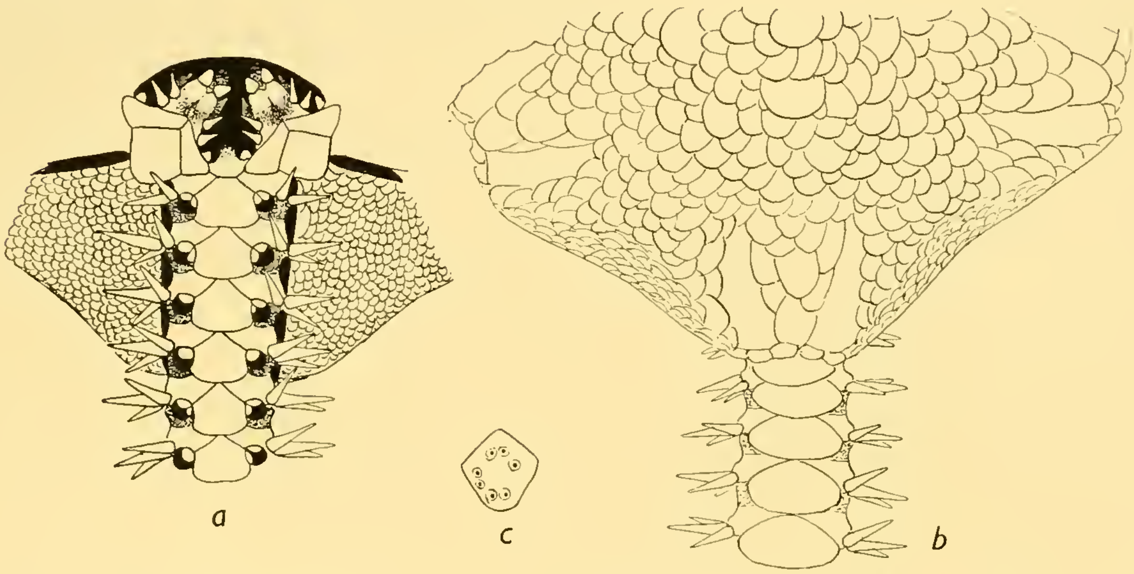


Fig. 26. *Amphioplus acutus*, n.sp. Part of oral side (*a*) and dorsal side (*b*). Madreporite (*c*). ×12.

One specimen, St. 181, has only four rays.

The species has separate sexes and is not viviparous.

In the elongate, pointed mouth papillae this species differs conspicuously from the other Antarctic species of *Amphioplus* (or *Amphiodia*). The same character is found in *Amphioplus gastracanthus* (Lütken and Mortensen) and *A. notacanthus* (Lütken and Mortensen) (Ophiuroidea of the Albatross Expedition, 1891, pl. xiii, figs. 4, 7); but these species are in other respects so different from the present species that there is hardly any close affinity between them. In *A. dispar* (Koehler) ('Investigator' Ophiuroidea, I, pl. x, fig. 81) one of the distal mouth papillae is long and spiniform; but this species otherwise has no resemblance to the present species.

To this species I must refer also some young specimens, up to 2·5 mm. diameter of disk, from St. 182. They differ conspicuously from the typical adult *Amphioplus acutus* in having only a single (but slender, spiniform) outer mouth papilla, and in having only three arm spines (exceptionally a joint here and there may have four spines). Otherwise

they agree completely with *A. acutus*, and as I find specimens of 3 mm. diameter of disk with the mouth papillae typically developed as in the adults, but still with only three arm spines, I cannot have any doubt but that these young specimens are actually the young *Amphioplus acutus*; the spiniform outer mouth papilla is thus the first to develop, and the species is passing through an *Amphiura* stage. It may be added that I have ascertained that gonads have not yet appeared in these young specimens.

Amphioplus aciculatus, n.sp.

St. 279. 10. viii. 27. Off Cape Lopez, French Congo, 58–67 m. 2 specimens.

Diameter of disk 2 mm.; arms apparently about four to five times the diameter of disk.

Scales of the dorsal side of disk coarse, with their free edge slightly raised. There is a very conspicuous but somewhat irregular rosette of primary plates. The radial shields

Fig. 27. *Amphioplus aciculatus*, n.sp. Part of oral side (*a*) and dorsal side (*b*). ×25.

are rather broad, about half the length of the disk radius, and contiguous in their distal half.

Outside the radial shields there is a rounded, knob-shaped plate which carries one to three small hyaline thorns. The ventral interradii are in one specimen somewhat sparsely covered with rounded scales, in the other almost naked. The buccal shields are rounded triangular, though with a small rounded outer lobe. The adoral plates are of rather unusual shape, with a straight inner side and a very broad outer lobe, widely separating the first lateral plate from the buccal shield. The outermost mouth papilla is small, scale-like, the second long, pointed, spine-like; the third is short, slightly pointed. The infradental papillae of moderate size, a little pointed. First ventral plate rather large, with convex distal edge. The following ventral plates distinctly longer than broad, contiguous, with sides and outer edge forming a slight re-entrant curve. Dorsal arm plates almost circular, not contiguous. Arm spines four, on the proximal joints, very slender and pointed. One small tentacle scale. No indication of particular colour.

Both specimens have the mouth very widely open. The disk is partly loosened from the arms and has contracted a little so as to become somewhat concave. The species appears to be liable to lose its disk.

This species appears to be the nearest related to the Japanese species *Amphiodia digitula* of H. L. Clark (North Pacific Ophiurans, p. 162, fig. 70; Matsumoto, Monograph of Japanese Ophiuroidea, p. 199, fig. 54) in which there is likewise a small spiny plate outside the radial shields. That the latter is referred to the genus *Amphiodia*, the present species to *Amphioplus*, is no serious objection to regarding them as related, the distinction between these genera not being sharp. As pointed out by Matsumoto the mouth papillae of *A. digitula* approach those of *Amphioplus*, and the present species might perhaps rather be referred to *Amphiodia*—it all depends on how strictly we limit those genera according to the number of the mouth papillae.

The character of the mouth papillae of the present species also recalls *Amphioplus acutus* (cf. Fig. 26 *a*, p. 295), but evidently there is no near relation between these two species.

Possibly the specimens in hand are only young ones; as they have been dried the condition of the genital organs cannot be ascertained.

Amphioplus peregrinator, Koehler

(Plate VII, figs. 12–15)

Amphioplus peregrinator, Koehler, 1912. II[e] Expéd. Antarct. Française. Echinodermes, p. 135, pl. xi, figs. 5, 11–12.

St. 175. 2. iii. 27. Bransfield Strait, South Shetlands, 200 m. 1 specimen.
St. 180. 11. iii. 27. Schollaert Channel, Palmer Archipelago, 160 m. 6 specimens.
St. 181. 12. iii. 27. Schollaert Channel, Palmer Archipelago, 160–335 m. 1 specimen.
St. 182. 14. iii. 27. Schollaert Channel, Palmer Archipelago, 278–500 m. 1 specimen.
St. 186. 16. iii. 27. Fournier Bay, Anvers Island, Palmer Archipelago, 295 m. 1 specimen.
St. 187. 18. iii. 27. Neumayr Channel, Palmer Archipelago, 259–354 m. 2 specimens.
St. 190. 24. iii. 27. Bismarck Strait, Palmer Archipelago, 98–130 m. 6 specimens.

There can be no doubt about the identity of these specimens with Koehler's *Amphioplus peregrinator*, described (*op. cit.*) from a single specimen collected by the 'Pourquoi-Pas?'. Some additional information may be gathered from these specimens, the largest of which reach a diameter of disk of *ca.* 11 mm. The incision in the interradial edges of the disk is not a constant character of the species; on the contrary, the disk, particularly in the larger specimens, often bulges out interradially, and may be considerably swollen. The proximal ventral plates are usually somewhat elevated. The arm spines are often four on the proximal joints in the larger specimens. The primary disk plates are usually very conspicuous, particularly in the young specimens.

The specimen from St. 182 shows distinct traces of colour; the ventral side of the arms and the adoral shields are a conspicuous orange, the same colour being also found on the radial shields and the primary plates of the disk. Also in dried specimens these plates may stand out lighter against the general dark grey colour of the disk. In the

specimen from St. 182 the dorsal side of the arms also shows a faint trace of orange colour.

The species has separate sexes, and is not viviparous.

The type specimen was taken at Port Lockroy, Palmer Archipelago, 70 m.; the species is thus as yet known only from the Palmer Archipelago and South Shetlands, 70–*ca.* 300 m.

From St. 182 there are a number of very young Ophiurids, which are not identifiable with certainty; but there are indications that they would have developed into Amphiurids, and not improbably *Amphiura peregrinator*. Unfortunately, the intermediate stages are lacking, so that certainty cannot be reached, and it seems, therefore, not desirable to give a description of these young specimens, the general appearance of which is not at all Amphiurid-like.

Family OPHIOCHITONIDAE

Ophionereis sexradia, n.sp.

St. 283. 14. viii. 27. Off Annobon, Gulf of Guinea, 18–30 m. 9 specimens.

Diameter of disk of largest specimen 6 mm.; arms six, about four times the diameter of the disk.

Scales of dorsal side of disk very small, but distinct, imbricating; they are slightly larger round the radial shields, which latter are small, about one-quarter the length of the disk radius, oval, separated by several rows of scales. No primary plates discernible. The ventral interradii look as if they were naked in the proximal half; in reality they are scale-covered throughout, as can be substantiated in dried specimens, but the skin is more or less conspicuously dark coloured in this proximal part, which conveys the impression that it is naked. Buccal shields spade-shaped, with a short, rounded distal lobe. Adoral plates narrow, but joining within. Usually four equal-sized mouth papillae on each side of jaw. Ventral arm plates somewhat longer than broad, contiguous, with convex distal edge and sides with a re-entrant curve. Dorsal arm plates broadly contiguous, somewhat longer than broad, with nearly straight distal edge. The supplementary plates of moderate size, but quite distinct. Three slender, equally long arm spines, slightly curved and flattened, of about the length of an arm joint. One large, oval tentacle scale. Colour in alcohol: the disk light greenish, with an elongate brownish spot at the base of each arm. Underside whitish, apart from the above mentioned dark proximal part of the interradii, this colour being evidently due to the stomach shining through the delicate body wall. Arms (and spines) whitish, or cream-coloured, with an irregular band of brownish on every fifth to sixth joint, the intervening part dotted with small brownish spots, in the main arranged in two longitudinal series.

Although in regard to the configuration of the plates and its general characters this species does not differ markedly from the other known species of the genus *Ophionereis*, it does so by having six arms, all the other species having five arms. Moreover, it appears

to practise self-division, three of the specimens in hand having the three arms in regeneration. This is not known to be the case in any other species of *Ophionereis*, as, indeed, self-division does not normally occur in five-armed Ophiurids. The fact that only three specimens out of nine show any trace of self-division indicates that this method of propagation is not constant, but evidently occurs only in a certain percentage of the specimens; still it is common enough to be regarded as a normal feature of the species.

In his memoir on the Echinoderms in Michaelsen's Meeresfauna Westafrikas Koehler does not record any species of *Ophionereis* from the African coast. Evidently he overlooked that Marktanner-Turneretscher (*Beschreibungen neuer Ophiuriden und Bemerkungen zu bekannten.* Ann. K. K. Naturhist. Hofmuseums, II, 1887, p. 301) has

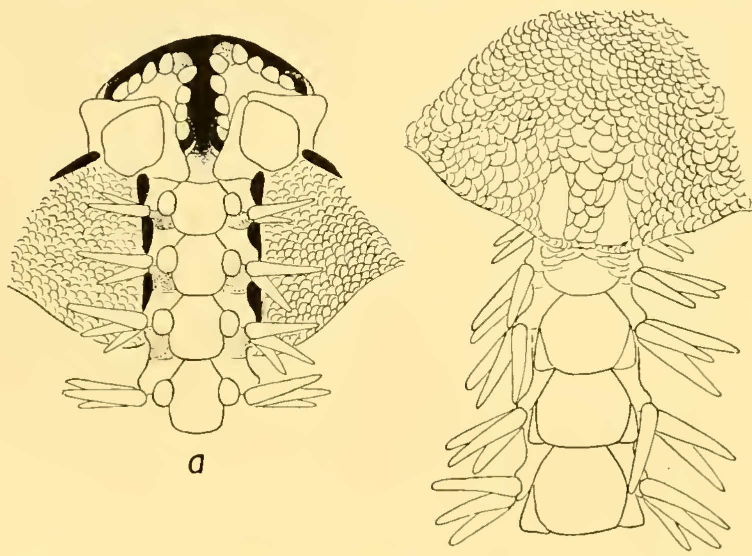


Fig. 28. *Ophionereis sexradia*, n.sp. Part of oral side (*a*) and dorsal side (*b*). ×20.

recorded a small specimen of *Ophionereis reticulata* from "Westafrika". It appears, however, that there must be some error in regard to this specimen. The locality given for it, 0° 7′ N, 23° 25′ W, is about in the middle of the Atlantic Ocean in very great depths. That an *Ophionereis reticulata* (or any other *Ophionereis*) should occur here may well be said to be out of the question, and the label of this specimen must evidently be wrong. If *Ophionereis reticulata* does actually occur off West Africa it is rather strange that it has not hitherto been met with there. At any rate, *Ophionereis sexradia* is the first species of *Ophionereis* that has been actually found to occur on the West African coast.

Ophionereis novae-zelandiae, n.sp.

St. 934. 17. viii. 32. 34° 11′ S, 172° 10′ E, Cook Strait, New Zealand, 98 m. 1 specimen.

Diameter of disk 4 mm.; arms *ca.* 30 mm. long, thus some seven to eight times the diameter of disk.

Scales of the dorsal side of disk rather coarse, uniform; the primary plates are small, but distinct, and form a fairly conspicuous rosette. The radial shields are small, oval,

scarcely one-third of the disk radius. The scales of the ventral interradii of the same size as those of the dorsal side of disk, rather thick. Buccal shields spade-shaped, with rounded corners and a small rounded outer lobe. Adoral plates narrow, joining within, with a conspicuous outer lobe separating the first lateral plate from the buccal shield. Mouth papillae as usual in *Ophionereis*. First ventral plate squarish, but broader distally. The following ventral plates broadly contiguous, about as broad as long, with convex outer edge and sides with a re-entrant curve. The outer corners not much produced. Dorsal arm plates rather squarish, with sides and distal edge almost straight.

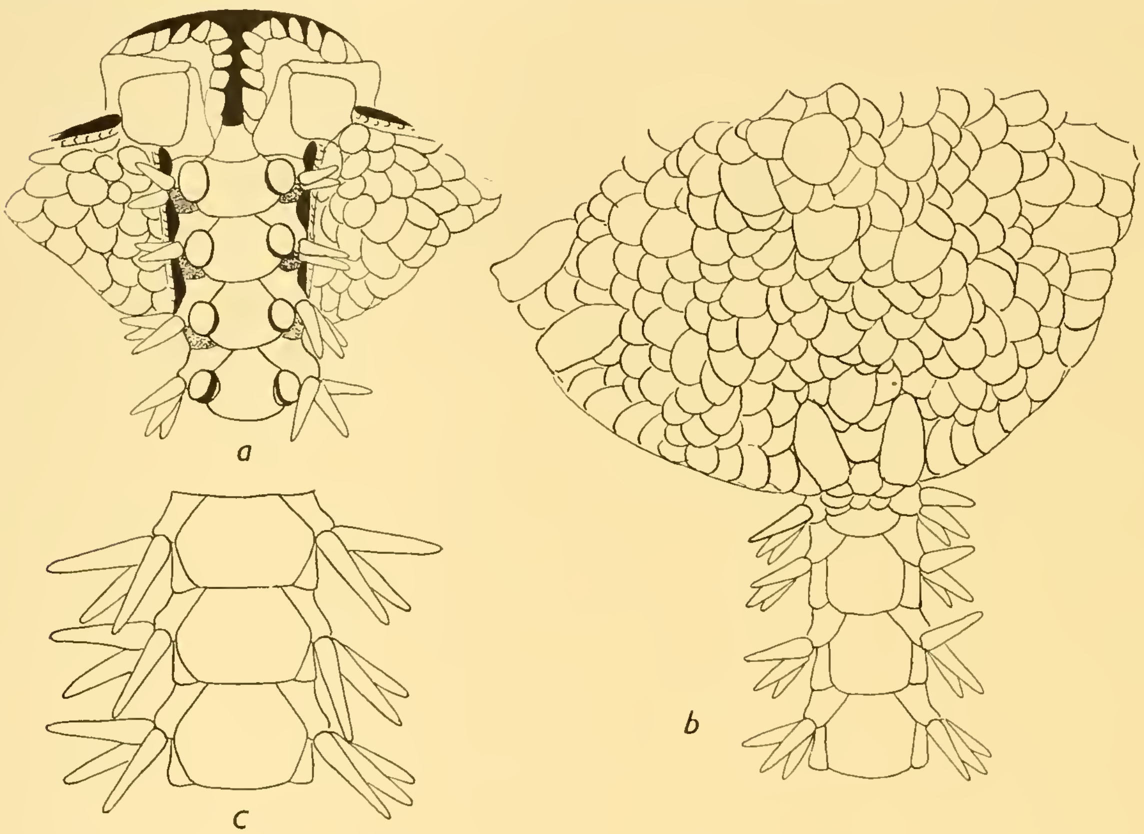


Fig. 29. *Ophionereis novae-zelandiae*, n.sp. Part of oral side (*a*) and dorsal side (*b*). ×22·5. Arm joints from middle of arm of a larger specimen; dorsal side (*c*). ×20.

The supplementary plate fairly large and distinct, almost rectangular in the proximal part of the arm. Three slender arm spines, about the length of an arm joint. One large, oval tentacle scale. Colour of dried specimen whitish, with a faint indication of brownish bands on the arms.

This species is about intermediate between *Ophionereis porrecta*, Lyman, and *O. australis* (H. L. Clark). From the former it differs notably in the shape of both dorsal and ventral arm plates. The arm spines also are longer and more slender than in *O. porrecta*, and the colour is lighter. From the South African *O. australis* it differs in the disk scales being smaller and more uniform; the shape of the dorsal plates and the supplementary plates is also rather different (cf. Mortensen, Echinoderms of South

Africa, fig. 77, p. 375). On the whole, in spite of the unfortunate fact that only a single specimen is at hand, and we thus do not know whether it is adult or only a young specimen, there can be no doubt that it is a distinct species, the genus *Ophionereis* being thus represented by two species in New Zealand seas. To the other New Zealand species, *Ophionereis fasciata* (Hutton), the present species is not closely related.

Family OPHIODERMATIDAE

Pectinura cylindrica (Hutton)

Pectinura cylindrica, Mortensen, 1924. *Echinoderms of New Zealand and the Auckland-Campbell Islands.* II, *Ophiuroidea.* Papers from Dr Th. Mortensen's Pacific Exped., xx (Vid. Medd. Dansk Naturh. Foren., 77), p. 172, figs. 35, 1–2.

P. cylindrica, Mortensen, 1925. *Ibid.*, III–V, p. 391.

For earlier literary references, see my paper of 1924, *loc. cit.*

St. 941. 20. iii. 32. 40° 53′ S, 174° 47′ E, Cook Strait, New Zealand, 128 m. Numerous specimens.

I may recall the fact that the species is viviparous and hermaphrodite (*op. cit.*, 1925).

Ophioderma longicauda, var. guineense, Greeff

Ophioderma guineense, Greeff, 1881. *Echinodermen beobachtet auf einer Reise nach der Guinea-Insel São Thomé.* Zool. Anzeiger, v, p. 156

O. longicauda, var. *guineense*, Koehler, 1914. Meeresfauna Westafrikas. Echinoderma, p. 173, pl. ix, figs. 1–3.

St. 283. 13. viii. 27. Off Annobon, Gulf of Guinea, 18–30 m. 4 specimens.

I quite agree with Koehler that this form from the Gulf of Guinea is not sufficiently different from the West Atlantic and Mediterranean *O. longicauda* to rank as a separate species. It may even be doubted whether it deserves the rank of a separate variety. But it is not the place here to enter on a detailed study of this question.

Family OPHIOLEPIDAE

Ophiozonella falklandica, n.sp.

St. WS 212. 30. v. 28. 49° 22′ S, 60° 10′ W, 242 m. *ca.* 10 adult specimens, and a great number of young ones.

St. WS 244. 18. vii. 28. 52° 00′ S, 62° 40′ W, 253 m. Several specimens.

St. WS 818. 17. i. 32. 52° 31′ S, 63° 25′ W, 272–278 m. 4 specimens.

St. WS 819. 17. i. 32. 52° 45′ S, 62° 27′ W, 329–242 m. 4 specimens.

St. WS 820. 18. i. 32. 52° 53′ S, 61° 51′ W, 351–367 m. 6 specimens.

St. WS 821. 18. i. 32. 52° 56′ S, 60° 55′ W, 461–468 m. 1 specimen.

St. WS 839. 5. ii. 32. 53° 30′ S, 63° 29′ W, 403–414 m. 1 specimen.

St. WS 871. 1. iv. 32. 53° 16′ S, 64° 12′ W, 336–341 m. 1 specimen.

Diameter of disk of largest specimen 10 mm.; arms rather robust, scarcely exceeding three times the diameter of disk.

Dorsal side of disk covered with coarse, but smooth scales, among which the primary plates are usually very conspicuous; in the younger specimens there are only some few

small plates in the corners between the primary plates, in larger specimens the primary plates are wholly separated by smaller plates. Generally there are two larger plates in the interradii. The radial shields are small, oval, widely separated by a series of two to three plates. The ventral interradii are covered by a varying number of plates, none of which are particularly conspicuous. The genital slits are narrow and short, not reaching beyond the end of the first lateral plate. The buccal shields are slightly irregular, with an acute inner angle; the inner sides concave, the outer edge convex; they may be distinctly longer than broad, or equally long and broad, there being thus a rather considerable variation in their shape. The adoral shields are short, broad distally, narrowing towards

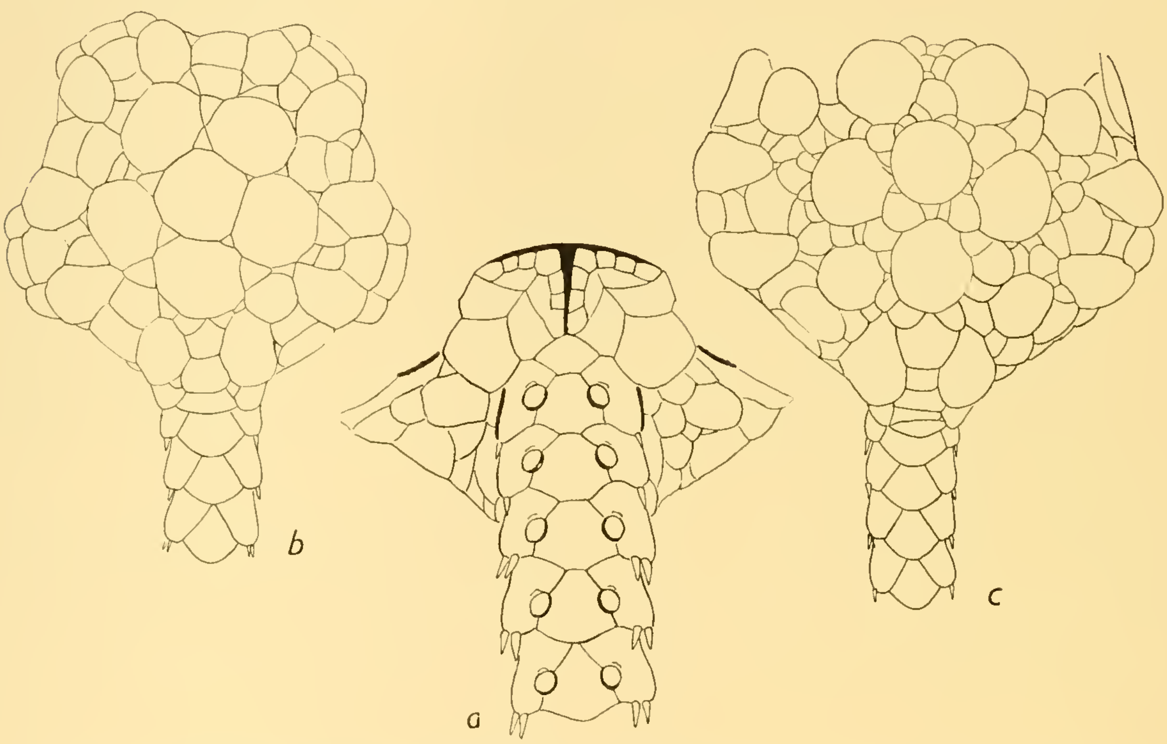


Fig. 30. *Ophiozonella falklandica*, n.sp Part of oral side (*a*). ×12. Dorsal side of two different specimens (*b*, *c*). *b*, ×9; *c*, ×6.

the median line, where they join; sometimes, however, they are about equally broad in their whole length, almost square. There are three or four square mouth papillae; the teeth are broad, rounded.

First ventral plate broader than long, with rather sharp corners. The following ventral plates contiguous till some distance beyond the disk; their outer edge somewhat produced. Dorsal arm plates contiguous on the proximal three or four joints, with straight sides and strongly convex distal edge. Two short, conical arm spines, the lowermost the longer, not half the length of the arm joint. One large, oval tentacle scale. Colour of the preserved specimens whitish.

This species is viviparous, but *not* hermaphrodite. There is only one gonad at each bursa, placed interradially. Some of the larger specimens, 6–8 mm. diameter of disk,

were found to have the gonads purely female; one specimen of 5 mm. has the gonads of purely male character, in another specimen of the same size the gonads contain only young eggs. There is thus no sign that the species is a protandric hermaphrodite.

I have found two to three young ones in a bursa. They are rather robust, with only three short, thick arm joints, when ready to leave the mother. The ventral interradii are occupied almost wholly by the adoral shields, the buccal shield still lying on the dorsal side, which is otherwise covered only by the large primary plates. It is an interesting fact that the second mouth tentacle is here still lying wholly outside the mouth slits; the mouth papillae have not yet been formed (Fig. 31).

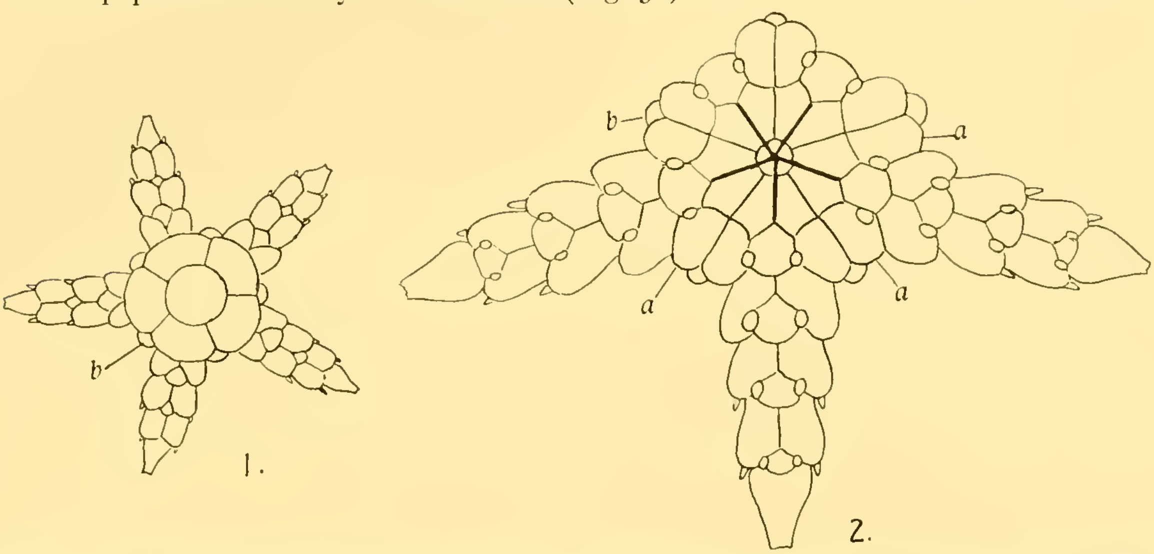


Fig. 31. *Ophiozonella falklandica*, n.sp. Young. 1, Dorsal side, ×15. 2, Oral side, ×30. *a*, Adoral plates. *b*, Buccal plate. Note that the tentacle scale at the first ventral plate has disappeared in the adult.

Ophiozonella alba (Lütken and Mortensen) ('Albatross' Ophiuroids, pl. vi, figs. 7–9) would seem to be the nearest relation of the present species, differing from it mainly in its longer arm spines, and in the arm joints being more constricted. Also the first ventral plate is characteristically different—much narrower than in *O. falklandica*.

Ophiozonella megaloplax, n.sp.

St. 939. 18. viii. 32. 35° 50′ S, 173° 28′ E, Cook Strait, New Zealand, 87 m. 1 specimen.

Diameter of disk 3 mm., arms *ca.* 7 mm. Dorsal side of disk covered with few large plates among which there is only an occasional small scale. No regular rosette of primary plates, the central plate can scarcely be made out. The radial shields are contiguous, only a single small scale wedged in between them proximally; a column of two broad scales in the interradii. The ventral interradii almost wholly covered by a single large plate joining the small, triangular buccal shield; beside this plate there are only the genital scales and a couple of plates distally. Adoral plates broadly joining within and with a conspicuous outer lobe separating the first lateral plate from the buccal shield. Four or five broad, square mouth papillae, the outermost one the largest. First ventral plate rhombic, merely in contact with the second; the following ventral plates

widely separated; their outer edge convex. The three proximal ones have their sides with re-entrant curves on account of the large, oval tentacle scale; from the fourth they are triangular, the tentacle scales being now smaller and placed at the lateral corners. The dorsal arm plates are triangular, widely separated. Only two short appressed arm spines. The genital slits show a slight proximal and distal widening; they end opposite the middle of the second lateral plate. The colour is a light greyish brown on the radial shields with the arms and the other disk plates whitish; also a couple of narrow whitish bands on the arms.

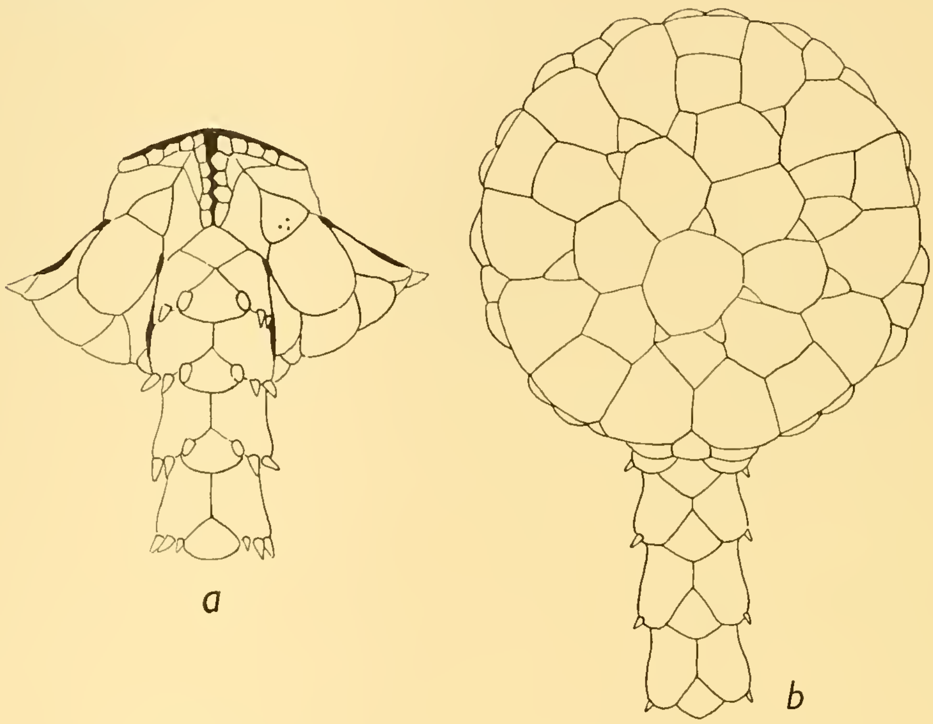


Fig. 32. *Ophiozonella megaloplax*, n.sp. Oral side (*a*) and dorsal side (*b*). *a*, ×22·5; *b*, ×20. The buccal plate with the three pores is the madreporite.

In particular, the covering of the ventral interradii distinguishes this species from all other known species of *Ophiozonella*, as also from *Ophiozonoida picta*, the only related species in New Zealand seas.

Ophiozonoida picta, H. L. Clark

Ophiozonoida picta, H. L. Clark, 1915. Cat. Recent Ophiurans, p. 340, pl. 18, figs. 3–4.

O. picta, Mortensen, 1924. *Echinoderms of New Zealand and the Auckland-Campbell Islands.* II, *Ophiuroidea.* Papers from Dr Th. Mortensen's Pacific Exped., xx (Vid. Medd. Dansk Naturh. Foren., 77), p. 168.

St. 934. 17. viii. 32. 34° 11′ S, 172° 11′ E, Cook Strait, New Zealand, 98 m. 4 specimens.

I have nothing to add to the descriptions of this beautiful little Ophiurid given in the two works quoted. One specimen was opened; it was found not to be viviparous.

Ophiolebella, n.g.

Disk covered with distinct, but irregular, not distinctly imbricating scales, among which the primary plates are not distinguishable. Generally some small granules are found on the plates or on the borders between the plates. Radial shields small, but distinct. Dorsal arm plates usually with a supplementary plate at the proximal edge. Mouth-papillae close-set, square. Teeth, no tooth papillae; there are only three teeth on each jaw. Pores of second mouth tentacles wholly within the mouth slits. Genital slits exceedingly short, scarcely 0·5 mm. long. Tentacle pores very small, covered by the small tentacle scales. Arm spines short, not much appressed. Arms often strongly inrolled.

Genotype: *Ophiolebes biscutifer*, G. A. Smith.

The reference of this characteristic species to the genus *Ophiolebes* I think quite unacceptable. In the shape of the mouth papillae in particular it is different from the typical *Ophiolebes* and this character seems to show conclusively that this little Ophiurid is no Ophiacanthid but an Ophiolepidid. The inrolling of the arms, of course, is unusual for an Ophiolepidid; but in *Ophioceres* also there is a tendency in this direction, and of its being an Ophiolepidid there can scarcely be any doubt. I think then that the present form belongs to the Ophiolepidae, but as a rather aberrant form, apparently not very closely related to any of the known genera, though in some degree recalling *Ophioceres*.

Ophiolebella biscutifera (G. A. Smith)

Ophiolebes biscutifer, G. A. Smith, 1923. *Report on the Echinoderms coll. during the voyage of the 'Quest'* (1921–2). Ann. Mag. Nat. Hist., 9 Ser., XII, p. 374.

St. 27. 15. iii. 26. West Cumberland Bay, South Georgia, 110 m. 9 specimens.
St. 39. 25. iii. 26. East Cumberland Bay, South Georgia, 179–235 m. 2 specimens.
St. 42. 1. iv. 26. Off mouth of Cumberland Bay, South Georgia, 102–104 m. Several specimens.
St. 123. 5. xii. 26. Off mouth of Cumberland Bay, South Georgia, 250 m. 2 specimens.
St. 140. 23. xii. 26. Stromness Harbour to Larsen Point, South Georgia, 122–136 m. Several specimens.
St. 144. 5. i. 27. Off mouth of Stromness Harbour, South Georgia, 178 m. 3 specimens.
St. 149. 10. i. 27. Mouth of East Cumberland Bay, South Georgia, 200–234 m. 3 specimens.
St. 152. 17. i. 27. 53° 51′ S, 36° 18′ W, South Georgia, 245 m. 6 specimens.
St. 156. 20. i. 27. 53° 51′ S, 36° 21′ W, South Georgia, 200–236 m. 5 specimens.
St. 159. 21. i. 27. 53° 48′ S, 36° 08′ W, South Georgia, 160 m. 3 specimens.
St. 160. 7. ii. 27. Off Shag Rocks, South Georgia, 177 m. Several specimens.
St. WS 840. 6. ii. 32. 53° 52′ S, 61° 49′ W, 368–463 m. 2 specimens (one 6-rayed).
St. MS 71. 9. iii. 26. East Cumberland Bay, South Georgia, 110–60 m. 1 specimen.

Referring to the description of this species given by G. A. Smith (*op. cit.*) I may confine myself to giving some additional remarks and some figures, Smith giving only a figure of the dorsal side.

The granules of the disk are exceedingly variable, as appears from the figures. Often there is a conspicuous group at the distal end of the radial shields, while other specimens show no granules at all, or only very few; but though the general appearance of such

naked specimens is very different from that of the grain-covered ones, there can be no doubt that they are only individual variations, the other characters being identical, and all intermediate stages being found. The supplementary dorsal plate may be very regularly developed, or it may be found only here and there (Fig. 33 *b*, *c*). The lateral plates may leave a space between them in the ventral midline, but the ventral plates remain just as widely separated as where the lateral plates join completely.

The genital slits vary somewhat in length, but they hardly exceed a length of 0·5 mm., and are often only half that length; there may be some granules at the slits. The adoral plates are excluded from the genital slits. The arm spines are three or four.

This species is viviparous and hermaphrodite, but not a protandric hermaphrodite. Even at a size of 3 mm. diameter the gonads are hermaphrodite. In such young specimens

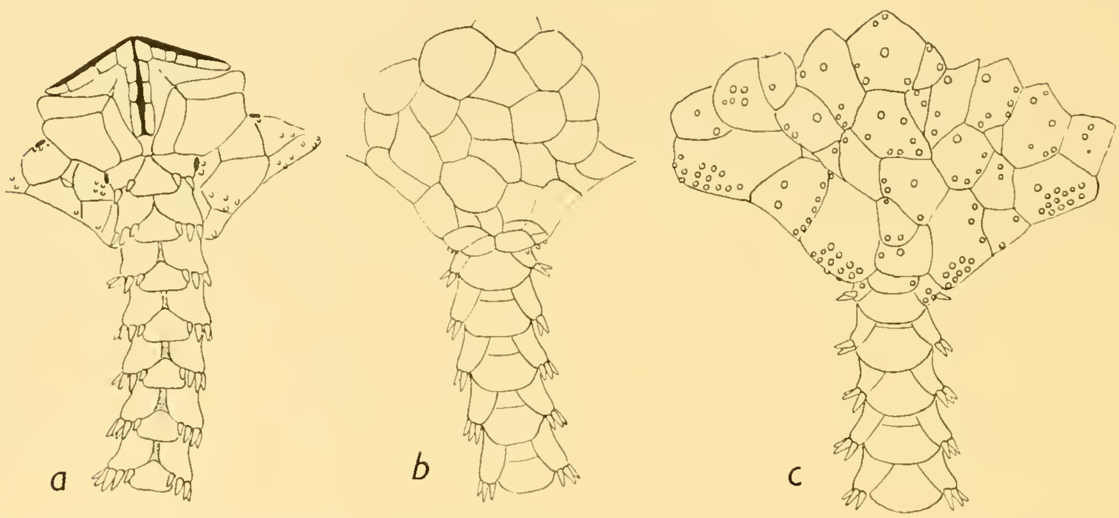


Fig. 33. *Ophiolebella biscutifera* (G. A. Smith). Part of oral side (*a*) and dorsal side (*b–c*) of two different specimens, one without, the other with granules. ×10.

there is only one gonad in each bursa, placed at the interradial side. At a size of 4 mm. diameter also an adradial gonad is present; this latter gonad would seem to be male at first, the young eggs appearing therein a little later than the sperm cells. At a diameter of 7 mm. there are two gonads at the interradial, one at the adradial side of the bursa, all of them containing both male and female genital products. At this size young ones are found in the bursae; I have found no more than three young ones in a specimen, but of an extraordinary size, up to 2 mm. in diameter of disk. It is difficult to imagine how such large young ones can get out through the minute genital slits, only 0·5 mm. long. What a squeezing they must undergo, in spite of their rather large, compact scaling. It would seem difficult enough for an arm alone of the young one to come out through the small slit—but such a large disk, and five radiating arms! It always makes one wonder, seeing the young ones in the bursae of viviparous Ophiurids so jammed together and distorted, how they can get clear of each other and assume normal radiate form. But the present case certainly seems to represent the climax of birth-difficulties

to the young ones—not to the mother, who must necessarily be entirely inactive, at most widening the genital slit as much as its small size allows.

One of the specimens 5·5 mm. in diameter from St. WS 840 has six arms. It looks rather different from the typical five-armed form. The buccal shields are much narrower, almost oval; the genital slits are somewhat longer, with a series of papillae along the edge. There is no supplementary plate to the dorsal arm plates. I think this specimen only an individual variation; the different shape of the buccal shields is, evidently, in the main due to the narrower space caused by the six rays. The other specimen from this same locality is rather intermediate between the six-rayed specimen and the common form in regard to the shape of the buccal shields.

Ophioceres incipiens, Koehler

(Plate VII, fig. 7.)

Ophioceres incipiens, Koehler, 1922. Austral. Antarct. Exped. Echinod. Ophiuroidea, p. 48, pl. lxxxiv, figs. 1–6, 13–14.

O. incipiens, Koehler, 1923. Swedish South Polar Exped. Astéries et Ophiures, p. 121.

O. incipiens, G. A. Smith, 1923. *Report on the Echinoderms coll. during the voyage of the 'Quest'* (1921–2). Ann. Mag. Nat. Hist., 9 Ser., XII, p. 370.

O. incipiens, Hertz, 1926. Deutsche Südpolar-Exped. Ophiuroiden, p. 25.

St. 27. 15. iii. 26. West Cumberland Bay, South Georgia, 110 m. 10 specimens.
St. 39. 25. iii. 26. East Cumberland Bay, South Georgia, 179–235 m. 1 specimen.
St. 42. 1. iv. 26. Off mouth of Cumberland Bay, South Georgia, 120–204 m. 10 specimens.
St. 140. 23. xii. 26. Stromness Harbour to Larsen Point, South Georgia, 122–136 m. 2 specimens.
St. 144. 5. i. 27. Off mouth of Stromness Harbour, South Georgia, 155–178 m. 8 specimens.
St. 152. 17. i. 27. 53° 51′ S, 36° 18′ W, South Georgia, 245 m. 6 specimens.
St. 156. 20. i. 27. 53° 51′ S, 36° 21′ W, South Georgia, 200–236 m. 8 specimens.
St. 159. 20. i. 27. 53° 48′ S, 36° 08′ W, South Georgia, 160 m. 4 specimens.
St. 160. 7. ii. 27. Off Shag Rocks, South Georgia, 177 m. 10 specimens.
St. 170. 23. ii. 27. Off Cape Bowles, Clarence Island, 342 m. Several specimens.
St. 175. 2. iii. 27. Bransfield Strait, South Shetlands, 200 m. 6 specimens.
St. 474. 12. xi. 30. 1 mile W of Shag Rocks, South Georgia, 199 m. 5 specimens.
St. MS 71. 9. iii. 26. East Cumberland Bay, South Georgia, 110–60 m. 1 specimen.

The specimen from St. 27 shows a very curious anomaly, two of the jaws being rudimentary (Plate VII, fig. 7).

It is a very interesting fact that often there is only one genital slit in some of the interradii.

This species is viviparous and hermaphrodite. In young specimens of *ca.* 5 mm. diameter of disk the gonads are male, but containing also quite young eggs. In specimens of *ca.* 7 mm. diameter I have found large young ones, one or two in each bursa (or gonad; cf. below). The young ones are rather large, 1·5 mm. in diameter of disk, and with five to six joints in the arms. As the genital slits are scarcely 1 mm. long, the young ones must change their shape considerably in order to get out, though the difficulties are not quite of the same order of magnitude as in *Ophiolebella biscutifera*.

After the birth of these young ones the parent specimen again turns mainly male, specimens of *ca.* 8–9 mm. diameter having the gonads full of sperms (or spermatogonia),

but with a new batch of young eggs. In the largest specimens, *ca.* 10 mm. diameter, I have found no young ones, but the ovaries filled with a number of large eggs (fifteen to twenty in each ovary). There may be one or two gonads at each side of the bursa; particularly when there is only one gonad at each side, these are greatly developed, looking like small, thick sausages, and filling up the disk almost completely. The bursae are seen distinctly, compressed between the gonads and empty, and it is certain that the eggs are lying in the gonads, not in the bursae. This seems to indicate that the development in this species is intra-ovarial (in the younger specimens it could not be ascertained whether the young ones are lying in the bursae or in the ovaries); in any case it is inexplicable how all these eggs could possibly get into the bursae. But, as it would seem, it is no less inexplicable how all these numerous eggs (or embryos) find room within the disk of the parent specimen, if they are going to develop to the same size as the young ones found in the specimens of *ca.* 7 mm. In these largest specimens the gonads appear to be purely female.

The species is thus not to be characterized as simply a protandric hermaphrodite; it is at first mainly male, then a breeding female, then again mainly male, and finally purely female.

Ophiolepis paucispina (Say)

Ophiolepis paucispina, Lütken, 1859. Additamenta ad hist. Oph., II, p. 204, Tab. ii, fig. 2.
O. paucispina, Koehler, 1914. Meeresfauna Westafrikas. Echinoderma, p. 177, pl. ix, fig. 14.

St. 283. 14. viii. 27. Off Annobon, Gulf of Guinea, 18–30 m. 1 specimen.

Attention should be called to the fact that this specimen has sometimes two, sometimes three arm spines, two being the normal number of spines in this species. Perhaps this is a character proper to the African specimens, which, if so, might be regarded as a variety of the typical West Indian form.

Ophiogona Döderleini (Koehler)

Ophioglypha Döderleini, Koehler, 1901. Result. Voyage 'Belgica'. Echinides et Ophiures, p. 19, pl. v, figs. 34–6.
O. Döderleini, Koehler, 1907. *Revision de la collection des Ophiures du Mus. d'Hist. Nat. Paris.* Bull. Sci. France Belgique, XLI, p. 293.
Ophiomaria Döderleini, A. H. Clark, 1916. Ophiomaria, *a new genus of Ophiurans from Southern South America and the adjacent portion of the Antarctic Continent.* Journ. Washington Acad. Sci., VI, p. 385.
O. Döderleini, Koehler, 1923. Swedish Antarct. Exped. Astéries et Ophiures, p. 126.

St. 177. 5. iii. 27. 27 miles SW of Deception Island, South Shetlands, 1080 m. 6 specimens.
St. 196. 3. iv. 27. Bransfield Strait, South Shetlands, 720 m. 1 specimen.

To the description of this species given by Koehler I may add a few remarks. Koehler states that the distal edge of the buccal plates is convex, and it is so represented in his fig. 35. I find it to be straight, or even slightly concave, as shown in Fig. 34 *a*. Further I find the shape of the dorsal and ventral plates somewhat different from that shown in Koehler's figures, so I have thought it desirable to give new figures thereof. The number of rudimentary dorsal plates at the base of arms, between the radial shields,

is very inconstant, sometimes four or five as shown by Koehler, sometimes only one or two, and examples of both may be found in one and the same specimen in different radii. The granules of the disk may continue between the first dorsal plates. In the larger specimens there may be as many as seven to eight arm spines. The species has separate sexes and appears not to be viviparous.

This species bears a very close resemblance to *Ophiogona laevigata* from Kerguelen, described by Studer (*Übersicht über die Ophiuriden S.M.S. 'Gazelle'*. Abh. Akad.

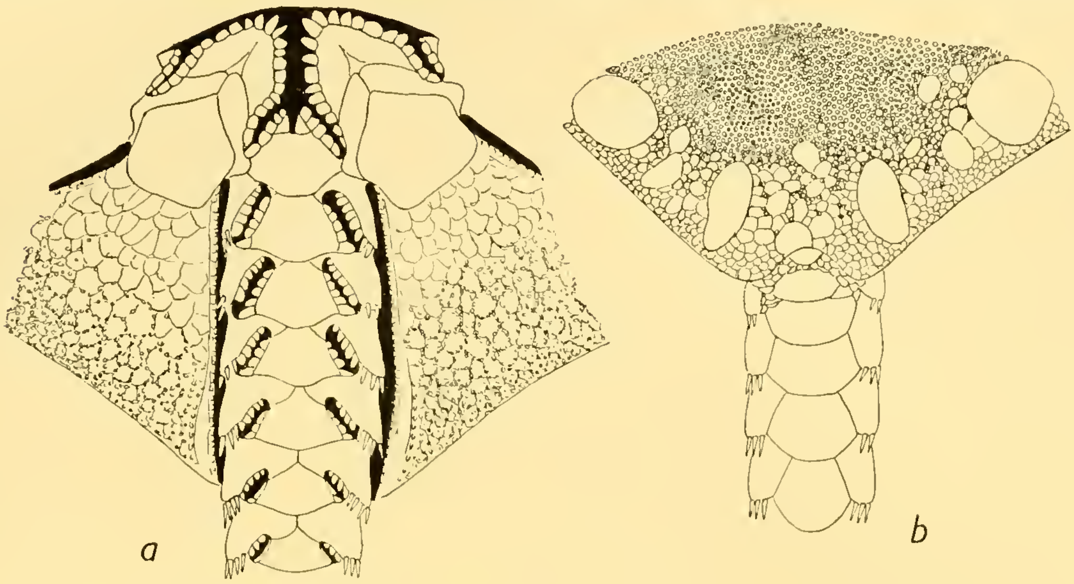


Fig. 34. *Ophiogona Döderleini* (Koehler). Part of oral side (*a*) and dorsal side (*b*). ×10.

Berlin, 1882, p. 6, Taf. 1, figs. 2 *a–c*). From the description and figures given by Studer I cannot gather any other difference than that in *O. laevigata* the radial shields are covered by granules, these being naked in the present species, and as this may quite probably be a difference due to age, the type of *O. laevigata* being no less than 40 mm. in diameter of disk (thus twice the size of the largest known specimens of *O. Döderleini*), this character alone does not justify us in regarding them as two distinct species. On application for the loan of the type material of *O. laevigata*, Professor W. Arndt of the Berlin Museum very kindly sent me a large specimen, 33 mm. in diameter, for comparison with my specimens. The only difference I can find is in the papillae of the first tentacle pore. As shown in Fig. 35 the papillae on the adradial side of the pore join in the radial mid-line, being all of them attached to the ventral plate itself; in *O. Döderleini* the adradial papillae of the first tentacle pore do not join in the radial mid-line, the two or three inner ones being attached to a small supplementary plate (Fig. 34 *a*). (Sometimes

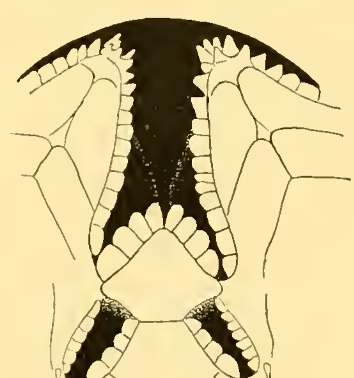


Fig. 35. *Ophiogona laevigata*, Studer. Part of mouth; showing the arrangement of the papillae along the first ventral plate. From cotype. ×6.

this supplementary plate is replaced by a small adradially-directed papilla.) Whether this is a constant difference it is, of course, impossible to ascertain from the single, very large specimen of *O. laevigata* (all the present specimens of *O. Döderleini* have it as described); but in any case I deem it better for the present to retain the name *Döderleini*. When new material of the Kerguelen form has been collected, it can be ascertained whether this difference holds good; if it does not, the name *Döderleini* will become a synonym of *laevigata*. (The specimen of *O. laevigata* examined has apparently lost the granules of the disk.)

The removal of this species from the genus *Ophiomaria*, to which it was referred by Austin H. Clark as accepted by Koehler, to *Ophiogona*, leads to the question whether Clark's genus *Ophiomaria* is not identical with the genus *Ophiogona*. I believe so; at least I do not find in the diagnosis of the genus *Ophiomaria* a single character that distinguishes it from *Ophiogona*. The reason why I hesitate to declare *Ophiomaria* a synonym of *Ophiogona*, is because the genotype of *Ophiomaria*, *O. tenella*, A. H. Clark, has never been figured. Perhaps it may be found to differ so much from *Ophiogona laevigata* and *Döderleini* in some point or other (though from the description that does not appear) that it may deserve to rank as the type of a separate genus.

Ophioperla Koehleri (Bell)

Ophiura Koehleri, Bell, 1908. National Antarct. Exped. Echinoderma, p. 11.

Ophioperla Ludwigi, Koehler, 1912. Ophioperla Ludwigi, *nov. gen.*, *nov. sp.* Zeitschr. wiss. Zool., CI, p. 259, Taf. xiii.

O. Ludwigi, Koehler, 1912. IIe Expéd. Antarct. Française. Echinodermes, p. 126, pl. x, figs. 1, 5–7.

O. Ludwigi, Koehler, 1922. Austral. Antarct. Exped. Echinod. Ophiuroidea, p. 51.

O. Ludwigi, Koehler, 1923. Swedish Antarct. Exped. Astéries et Ophiures, p. 127.

St. 42. 1. iv. 26. Off mouth of Cumberland Bay, South Georgia, 120–204 m. 10 specimens.
St. 45. 6. iv. 26. 2·7 miles S 85° E of Jason Light, South Georgia, 238–270 m. 3 specimens.
St. 140. 23. xii. 26. Stromness Harbour to Larsen Point, South Georgia, 122–136 m. 1 specimen.
St. 144. 5. i. 27. Off mouth of Stromness Harbour, South Georgia, 155–178 m. 4 specimens.
St. 170. 23. ii. 27. Off Cape Bowles, Clarence Island, 342 m. 2 specimens.
St. 175. 2. iii. 27. Bransfield Strait, South Shetlands, 200 m. 1 specimen.
St. 177. 5. iii. 27. 27 miles SW of Deception Island, South Shetlands, 1080 m. 1 specimen.
St. 196. 3. iv. 27. Bransfield Strait, South Shetlands, 720 m. 2 specimens.
St. 474. 12. xi. 30. 1 mile W of Shag Rock, South Georgia, 199 m. 10 specimens.

To the very careful description given by Koehler (*op. cit.*, 1912) I would only add that the radial shields sometimes remain naked to some extent, so as to appear as small, widely separated, oval plates.

One of the specimens from St. 42 is stated to have had the upper side of disk and arms bright pink in life, the under side white. In alcohol all trace of colour is lost.

In young specimens, 3–4 mm. in diameter of disk, the scales of the dorsal side of the disk are almost completely naked, a granule having only begun to appear here and there. There is a distinct central plate, but the other primary plates are scarcely discernible; the scales of the disk are imbricating. The radial shields are short and broad, widely

divergent, scarcely joining distally. The arm spines are slender, pointed, not yet broad and flattened as in the adult. There are already four tentacle scales—or rather papillae—at the proximal pore pairs.

This species is not viviparous; it has separate sexes, there being in both sexes a series of gonads along both the adradial and the interradial side of the bursal slit. The eggs are very small, a fact which indicates that the species may have a typical *Ophiopluteus* larva.

It was quite a surprise to me, when seeing the type specimen of Bell's *Ophiura Koehleri*, which was sent me for examination from the British Museum, to find that it was identical with Koehler's *Ophioperla Ludwigi.* From the very poor description given by Bell nobody could imagine what the species would be like, and the fact that Bell did not give any figures of it, together with the erroneous statements that the disk is covered by smooth skin (it is a dense covering of very fine granules), and that the lower arm spines are deeply imbedded in the skin, could only be misleading and bewildering. Thus it came about that the species dedicated by Bell to Koehler was dedicated again unawares by Koehler to Ludwig. As for Bell expressing his regret that he had not "something better to offer to the honour of the distinguished French naturalist who has done so much for our knowledge of Ophiuroids", there was in reality only reason to regret the bad description he gave; the species is good and interesting enough, and must henceforth bear Koehler's name instead of that of Ludwig. Fortunately, this necessary change of name does not do much harm scientifically, the species having only very few times been mentioned in literature.

Ophionotus victoriae, Bell

Ophionotus victoriae, Bell, 1902. Rep. Nat. Hist. Collections 'Southern Cross'. Echinoderma, p. 219, pl. xxviii.

O. victoriae, Koehler, 1912. II^e Expéd. Antarct. Française. Echinodermes, p. 114, pls. x, figs. 2–4, 12–13; xi, fig. 8.

O. victoriae, Koehler, 1922. Austral. Antarct. Exped. Echinod. Ophiuroidea, p. 51.

O. victoriae, Koehler, 1923. Swedish Antarct. Exped. Astéries et Ophiures, p. 124.

O. victoriae, Hertz, 1926. Deutsche Südpolar-Exped. Ophiuroiden, p. 16.

O. victoriae, Hertz, 1927. Deutsche Tiefsee-Exped. Ophiuroiden, p. 67.

O. victoriae, Grieg, 1929. *Echinodermata from the Palmer Archipelago.* Sci. Results Norwegian Antarct. Exped., 1927–29, 11, 9.

St. 173. 28. ii. 27. Port Foster, Deception Island, South Shetlands, 5–60 m. 11 specimens.
St. 175. 2. iii. 27. Bransfield Strait, South Shetlands, 200 m. 1 specimen.
St. 180. 11. iii. 27. Schollaert Channel, Palmer Archipelago, 160–330 m. 10 specimens.
St. 195. 30. iii. 27. Admiralty Bay, King George Island, South Shetlands, 391 m. 14 specimens.
St. 366. 6. iii. 30. 4 cables S of Cook Island, South Sandwich Islands, 155–322 m. 7 specimens.
St. 371. 14. iii. 30. 1 mile E of Montagu Island, South Sandwich Islands, 99–161 m. 3 specimens.
St. 456. 18. x. 30. 1 mile E of Bouvet Island, 40–45 m. Several specimens.
St. 458. 19. x. 30. 7 miles S 50° W of Cape Circumcision, Bouvet Island, 357–377 m. 10 specimens.

There are further a number of specimens from Deception Island, South Shetlands, 25–30 fathoms, without exact dates.

Koehler (*op. cit.*, 1912) has suggested that this species is oviparous, in contradistinction to the viviparous *O. hexactis*. I can confirm this suggestion; also it has separate sexes, as is usual in non-viviparous Ophiurids. The eggs are small and numerous. It is thus very probable that it has a typical *Ophiopluteus* larva—the more probable since the viviparous *O. hexactis* passes through a rudimentary larval stage within the ovary.

Hertz (*op. cit.*, 1927) states that the two species *O. hexactis* and *victoriae* "scheinen sich gegenseitig auszuschliessen bzw. zu vertreten". It is true that the areas of distribution of the two species appear on the whole markedly distinct, the former being in the main confined to the Kerguelen and the South Georgia regions, the latter mainly to the Antarctic region and the sea round Bouvet Island. But that they do not quite exclude one another appears from the fact that *O. victoriae* is recorded by Grieg (*op. cit.*) from South Georgia, where *O. hexactis* abounds. But it seems that in regard to these two species the same condition prevails as between *Ophiura Sarsi*, Lütken, and *Ophiopleura borealis*, Koren and Danielssen, in the Arctic seas (cf. Mortensen, 1932, *Echinoderms of the Godthåb Expedition*. Medd. om Grønland, 79, 2, p. 30), viz. that these species do not like each other's company and thus in general exclude one another.

Grieg's observations (*op. cit.*) on the year classes shown by this species may be well founded (in contradistinction to his finding year classes in *Ophiopleura borealis* and other deep-sea Echinoderms; cf. my work on the 'Ingolf' Ophiuroidea, p. 95; Monograph of the Echinoidea, II, p. 110).

Ophionotus hexactis (E. A. Smith)

Ophioglypha hexactis, E. A. Smith, 1876. *Description of species of Asteridae and Ophiuridae from Kerguelen's Islands.* Ann. Mag. Nat. Hist., 4 Ser., XVII, p. 111.

Ophionotus hexactis, Koehler, 1912. IIe Expéd. Antarct. Française. Echinodermes, pl. xii, figs. 1, 3.

Ophiura hexactis, H. L. Clark, 1915. Cat. Recent Ophiurans, p. 320, pl. 19, figs. 5–6.

Ophionotus hexactis, Koehler, 1917. *Echinodermes de Kerguelen.* Ann. Inst. Océanogr., VII, 8, p. 61, pl. v, fig. 15.

O. hexactis, Mortensen, 1920. *On hermaphroditism in viviparous Ophiurids.* Acta Zoologica, 1, p. 16.

O. hexactis, Mortensen, 1921. Studies of the development and larval forms of Echinoderms, p. 179, pl. xxxii.

O. hexactis, Koehler, 1923. Swedish Antarct. Exped. Astéries et Ophiures, p. 125, pl. xiv, fig. 10.

O. hexactis, Hertz, 1926. Deutsche Südpolar-Exped. Ophiuroiden, p. 17.

O. hexactis, Hertz, 1927. Deutsche Tiefsee-Exped. Ophiuroiden, 1, p. 68, Taf. vi, fig. 4.

O. hexactis, Tortonese, 1934. *Gli Echinodermi del Museo di Torino.* II, *Ofiuroidi.* Boll. Mus. Zool. Torino, XLIV, p. 43, Tav. vii, figs. 42–6.

For the older literature cf. Koehler's work of 1917, *loc. cit.*

St. 28. 16. iii. 26. West Cumberland Bay, South Georgia, 168 m. 3 specimens (fragments).

St. 39. 25. iii. 26. East Cumberland Bay, South Georgia, 179–235 m. 6 specimens.

St. 42. 1. iv. 26. Off mouth of Cumberland Bay, South Georgia, 120–204 m. 12 specimens.

St. 45. 6. iv. 26. 2·7 miles S 85° E of Jason Light, South Georgia, 238–270 m. 10 specimens.

St. 140. 23. xii. 26. Stromness Harbour to Larsen Point, South Georgia, 122–136 m. 10 specimens (young).

St. 142. 30. xii. 26. East Cumberland Bay, South Georgia, 88–273 m. 14 specimens.
St. 144. 5. i. 27. Off mouth of Stromness Harbour, South Georgia, 155–178 m. 5 specimens.
St. 149. 10. i. 27. Mouth of East Cumberland Bay, South Georgia, 200–234 m. 1 specimen.
St. 474. 12. xi. 30. 1 mile W of Shag Rocks, South Georgia, 199 m. 10 specimens.
St. 1562. 7. iv. 35. 46° 53′ S, 37° 55′ E, off Marion Island, 97–104 m. 1 specimen.
St. 1563. 7. iv. 35. 46° 48′ S, 37° 49′ E, off Marion Island, 113–99 m. 9 specimens.
St. WS 25. 17. xii. 26. Undine Harbour (North), South Georgia, 18–27 m. 4 specimens.
St. WS 27. 19. xii. 26. 53° 55′ S, 38° 01′ W, South Georgia, 107 m. 1 specimen.
St. WS 33. 21. xii. 26. 54° 59′ S, 35° 24′ W, South Georgia, 130 m. 7 specimens.
St. WS 56. 14. i. 27. Larsen Harbour, Drygalski Fjord, South Georgia, 2 m. (kelp roots). 1 specimen.
St. WS 62. 19. i. 27. Wilson Harbour, South Georgia, 15–45 m. Several specimens.
St. WS 177. 7. iii. 28. 54° 58′ S, 35° 00′ W, South Georgia, 97–0 m. 3 specimens.
St. MS 10. 14. ii. 25. East Cumberland Bay, South Georgia, 26–18 m. 10 specimens.
St. MS 14. 17. ii. 25. East Cumberland Bay, South Georgia, 109–180 m. 8 specimens.
St. MS 15. 17. ii. 25. East Cumberland Bay, South Georgia, 109 m. 20 specimens.
St. MS 32. 1. v. 25. East Cumberland Bay, South Georgia, 40 m. Several specimens.
St. MS 68. 2. iii. 26. East Cumberland Bay, South Georgia, 220–247 m. Several specimens.
St. MS 69. 5. iii. 26. East Cumberland Bay, South Georgia, 146 m. 4 specimens.
St. MS 71. 9. iii. 26. East Cumberland Bay, South Georgia, 110–60 m. 16 specimens.
St. MS 74. 17. iii. 26. East Cumberland Bay, South Georgia, 32–40 m. 1 specimen.

This species is now so well known and well figured, particularly by Koehler (*op. cit.*, 1912) and by Clark (*op. cit.*, 1915), that there is no reason to give further descriptive notes on it. The fact that a five-armed specimen (St. 45) contains only six-rayed young ones is worth mentioning.

I may recall my observations (*op. cit.*, 1920, 1921) proving the species to be hermaphrodite and to have intra-ovarial development, the young ones passing through a "pelagic" larval stage within the ovary.

One of the specimens from St. 1563 is remarkable in having no radial shields at the base of one of the arms. Apparently it is only a case of abnormal regeneration.

Ophiomages cristatus, Koehler

Ophiomages cristatus, Koehler, 1923. Swedish Antarct. Exped. Astéries et Ophiures, p. 118, pl. xv, figs. 7–10.

St. 164. 18. ii. 27. Normanna Strait, Coronation Island, South Orkneys, 24–36 m. 1 specimen.

This specimen has a diameter of disk of 14 mm. and an arm length of *ca.* 45 mm., and thus considerably exceeds in size the two previously known specimens. It is in perfect agreement with the description and figures given by Koehler. The label states that the colour in life was "bright peach red" (Ridgway scale, 500–Ra). In alcohol the colour has completely faded.

This species is *viviparous*. Finding that an arm of a young one protruded through one of the genital slits, I opened one of the interradii with the view to ascertaining whether it is also perhaps hermaphrodite. This, however, could not be made out without damaging the precious specimen, which I did not think desirable. The gonads at the inter-

radial side of the bursal slits proved to be female; quite possibly male gonads may be situated adradially to the genital slits, on the dorsal side of the arm (as is the case for example in *Ophionotus hexactis*), but this must be left undecided.

It appears very probable that the development is intra-ovarial, as in *Ophionotus hexactis*. The gonads contain a considerable number of small eggs, besides one or two of larger size. It is thus very probable that only these large eggs develop into embryos, the other eggs serving as food for the embryo, as is the case in *O. hexactis*. One of the gonads from the interradius which I opened is considerably swollen, there being a large empty space with no eggs on the wall, and the small eggs in the basal part of the gonad apparently somewhat reduced in size. Unfortunately the large egg (or embryo) within this gonad is in an exceedingly poor state of preservation; but I can scarcely have any doubt that we have here a case similar to that which occurs in *Ophionotus hexactis*.

It is worth mentioning that the young ones have no regular rosette of primary disk plates.

The genus *Ophiomages* is evidently closely related to *Ophiosteira*; indeed, I rather think it ought to be united with that genus, which would then comprise the two species: *antarctica*, Bell, and *cristatus* (Koehler). (As for *O. Senouqui*, cf. below, p. 315.)

Ophiosteira Senouqui, Koehler

? *Ophioglypha carinifera*, Koehler, 1901. Result. Voyage 'Belgica'. Echinides et Ophiures, p. 14, pl. i, figs. 3–5.

Ophiosteira Senouqui, Koehler, 1912. IIe Expéd. Antarct. Française. Echinodermes, p. 110, pl. x, figs. 8–11.

O. Senouqui, Koehler, 1922. Austral. Antarct. Exped. Echinod. Ophiuroidea, p. 46, pl. lxxxvii, figs. 1–5.

O. Senouqui, Hertz, 1926. Deutsche Südpolar-Exped. Ophiuroiden, p. 24, Taf. v, figs. 1–3, 7.

St. 170. 23. ii. 27. Off Cape Bowles, Clarence Island, 342 m. 2 specimens.
St. 175. 2. iii. 27. Bransfield Strait, South Shetlands, 200 m. 2 specimens.
St. 187. 18. iii. 27. Neumayr Channel, Palmer Archipelago, 259–354 m. 1 specimen.
St. 190. 24. iii. 27. Bismarck Strait, Palmer Archipelago, 93–130 m. 1 specimen.
St. 599. 17. i. 31. 67° 08′ S, 69° 06′ W, Graham Land, 203 m. 2 specimens.
St. WS 94. 16. iv. 27. 50° 00′ S, 64° 58′ W, 110–126 m. 1 specimen.
St. WS 97. 18. iv. 27. 49° 00′ S, 61° 58′ W, 145–146 m. 1 specimen.
St. WS 212. 30. v. 28. 49° 22′ S, 60° 10′ W, 242–249 m. 1 specimen.
St. WS 245. 18. vii. 28. 52° 36′ S, 63° 40′ W, 304–290 m. 3 specimens.
St. WS 871. 1. iv. 32. 53° 16′ S, 64° 12′ W, 336–341 m. 1 specimen.

It is evident that *Ophiosteira Senouqui* is at least very closely related to, if not identical with, the species described by Koehler in his report on the 'Belgica' Echinoderms under the name *Ophioglypha carinifera*, and I can only wonder that Koehler in describing *O. Senouqui* did not make any reference to *carinifera*. Judging from the description of *carinifera* the only difference from *Senouqui* is the existence of granules between the plates of the disk. Koehler's figures show these granules very distinctly, and having recently had an opportunity of seeing the type specimen in the Brussels Museum I can testify to the correctness of Koehler's figures in this regard. The description states that

the granules are "très fins", and that in the centre of the disk they even encroach upon the surface of the plates themselves, as also upon the surface of the radial shields. But this is exactly what is also found, to a varying degree, in *Senouqui*; on the ventral interradii these granules also occur, sometimes even on the edge of the buccal shields. It seems that the only difference between *carinifera* and *Senouqui* is that in the former the granules are somewhat larger—a character of very small value, even if constant. I expect, therefore, that it will ultimately be found that *O. Senouqui* is identical with *O. carinifera*, and the name *Senouqui* will then have to be dropped as a synonym of *carinifera*.

Hertz (*op. cit.*, 1926, p. 25, note) expresses the opinion that the genus *Ophiosteira* is untenable, and at the same time establishes a new genus *Ophiuroglypha*, the main characters of which are the reduction of the ambulacral pores and, particularly, the transformation of the second arm spine into a glassy, upturned hook. To this genus, besides the genotype, *O. Lymani* (Ljungman), she also refers *Ophiosteira Senouqui* and a number of other species which do not concern us here. Since there are within the species *Senouqui* all possible transitions between specimens with strongly elevated plates, as in typical *Ophiosteira*, and with perfectly flat plates, as in *O. Lymani*, it seems quite natural to regard *O. Senouqui* and *O. Lymani* as congeneric. But this does not do away with the genus *Ophiosteira*. The character of the arm spines seems to constitute a valid distinction between the two genera. In *Ophiosteira* there are a considerable number of arm spines (five to nine), none of which are transformed into a hook, while in *Ophiuroglypha* there are only three arm spines, the second of which is, in the distal part of the arms, transformed into an upturned glassy hook. Accordingly, on this basis *O. Senouqui* (*carinifera*) is not an *Ophiosteira*, but an *Ophiuroglypha*, as maintained by Hertz.

The matter, however, is not so simple. A. H. Clark, in his paper on Ophiomaria, *a new genus of Ophiurans from Southern America and the adjacent portion of the Antarctic Continent* (Journ. Wash. Acad. Sci., VI, 1916, p. 385), refers the species *carinifera* to his new genus *Ophiomaria*, with which Koehler agrees (Swedish Antarct. Exped., Astéries et Ophiures, p. 127). Is then Hertz' genus *Ophiuroglypha* identical with, and only a synonym of, Clark's genus *Ophiomaria*? And should the present species be named *Ophiomaria Senouqui* (or *carinifera*)? As yet nobody can tell. The genotype of *Ophiomaria* is *O. tenella*, A. H. Clark, from off the coast of Chile. Unfortunately Clark does not give any figures of this species, and in the description he gives no information on the character of the arm spines, whether any of them is transformed into a hook or not. It rather seems that Clark's *Ophiomaria* is identical with Studer's genus *Ophiogona* (cf. above, p. 310), and that Hertz' name *Ophiuroglypha* will be available for *O. Lymani* and *Senouqui-carinifera*; but for the present we cannot take that for granted.

In view of the uncertainty in regard to these various points, I prefer for the present to retain the name *Ophiosteira Senouqui* for the species in question; but I expect that its correct name will ultimately be found to be *Ophiuroglypha carinifera* (Koehler).

It remains to be seen whether the other species referred to *Ophiosteira*—*O. echinulata*, Koehler, *O. debitor*, Koehler, and *O. rotundata*, Koehler (Austral. Antarct. Exped.), and *O. Koehleri*, A. H. Clark, from off the coast of Ecuador (Proc. Biol. Soc. Wash. XXX,

1917, p. 173)—really belong to that genus or rather to *Ophiuroglypha*. Koehler does not mention the character of the spines; but it seems not improbable that the two species *debitor* and *rotundata*, with only three arm spines, will have the middle one transformed into a hook, and thus will belong to *Ophiuroglypha*, whereas *O. echinulata*, with eight to nine spines, is a true *Ophiosteira*—indeed, I think it identical with *O. antarctica*. Having had an opportunity of examining the material of *O. antarctica* in the British Museum, I find all possible transitions between specimens that have all the plates of the disk perfectly smooth and those that have all the plates provided with a strong spine, the character of *O. echinulata*. Sometimes only the central plate has such a spine, the other plates being wholly smooth; in other specimens the central plate is smooth, the other plates having each a strong spine. Also in regard to the development of the radial keel there are all transitions, from a low, rounded, sausage-like elevation to a high, sharp edge. Neither can I discover any difference in the shape of the buccal shields—in short, I cannot find a single character of any value distinguishing *echinulata* from *antarctica*, and must, accordingly, regard *echinulata* as synonymous with *antarctica*. Thus in all probability the latter remains the only species of the genus *Ophiosteira*—unless *Ophiomages cristatus*, Koehler, is also a true *Ophiosteira*, which I think quite probable.

Ophiosteira antarctica is viviparous and hermaphrodite. There are three to four male gonads along the adradial side of the bursal slit, and one to two female gonads along the interradial side. I have found two to five young ones in each bursa, all at very nearly the same stage of development.

The species *O. Senouqui* has separate sexes and is not viviparous. There are a number of gonads along both the adradial and the interradial side of the bursal slits. The eggs are small and very numerous, indicating the probable existence of a typical *Ophiopluteus* larva. The bursal walls are quite strong and contain a great number of fenestrated plates.

Ophiuroglypha Lymani (Ljungman)

(Plate VIII, fig. 3)

Ophioglypha Lymani, Ljungman, 1870. *Om tvänne nya arter Ophiurider*. Öfvers. K. Vetenskaps. Akad. Förhandl. Stockholm, 1870, p. 472.

O. Lymani, Ludwig, 1898. *Die Ophiuren d. Sammlung Plate*, Zool. Jahrb. Suppl., p. 751.

O. Lymani, Ludwig, 1899. Ophiuroideen Hamburger Magalh. Sammelreise, p. 5.

O. Lymani, Koehler, 1907. *Revision de la collection des Ophiures du Mus. d'Hist. nat. Paris*. Bull. Sci. France Belgique, XLI, p. 295, pl. x, figs. 11–12.

Ophiura Lymani, H. L. Clark, 1915. Cat. Recent Ophiurans, p. 322.

O. Lymani, Koehler, 1923. Swedish Antarct. Exped. Astéries et Ophiures, p. 126.

Ophiuroglypha Lymani, Hertz, 1926. Deutsche Südpolar-Exped. Ophiuroiden, p. 25, Taf. v, figs. 4–6, 8.

O. Lymani, Hertz, 1927. Deutsche Tiefsee-Exped. Ophiuroiden, p. 85.

St. 152. 17. i. 27. 53° 51′ S, 36° 18′ W, South Georgia, 245 m. 2 specimens.
St. 156. 20. i. 27. 53° 51′ S, 36° 21′ W, South Georgia, 200–236 m. Several large specimens.
St. 159. 21. i. 27. 53° 52′ S, 38° 08′ W, South Georgia, 160 m. 1 specimen.
St. 160. 7. ii. 27. Near Shag Rocks, South Georgia, 177 m. 1 specimen.
St. 474. 12. xi. 30. 1 mile W of Shag Rocks, South Georgia, 199 m. 1 specimen.

St. WS 81. 19. iii. 27. 8 miles N 11° W of North Island, West Falkland Islands, 81–82 m. 3 specimens.
St. WS 91. 8. iv. 27. 52° 54′ S, 64° 37′ W, 191–205 m. 4 specimens.
St. WS 92. 8. iv. 27. 51° 58′ S, 65° 01′ W, 143–145 m. 6 specimens.
St. WS 212. 30. v. 28. 49° 22′ S, 60° 10′ W, 242–249 m. 2 specimens.
St. WS 243. 17. vii. 28. 51° 06′ S, 64° 30′ W, 141–144 m. 1 specimen.
St. WS 806. 7. i. 32. 50° 03′ S, 64° 21′ W, 122–129 m. 1 specimen.
St. WS 815. 13. i. 32. 51° 52′ S, 65° 44′ W, 132–162 m. 5 specimens.
St. WS 819. 17. i. 32. 52° 42′ S, 62° 39′ W, 312–329 m. 2 specimens.
St. WS 840. 6. ii. 32. 53° 52′ S, 61° 49′ W, 368–463 m. 1 specimen.

One of the specimens from St. 156 was photographed before preservation (Plate VIII, fig. 3). The colour in life is stated to be "disk bright red above with all the plates white". A specimen preserved in formalin (St. WS 806) still shows very faint traces of the red colour; the specimens preserved in alcohol have lost all colour, except one from St. WS 816, which shows the red colour better than does the specimen in formalin.

Some of the specimens (St. WS 815) might equally well be identified as *Ophiosteira Senouqui*, there being in reality no sharp limit between these two forms, in spite of their being designated by two different generic names (cf. above, p. 315).

The character of the gonads, as was to be expected, is exactly as in *O. Senouqui*. Also the colour of the live specimens is the same in the two species, there being a note about one of the specimens from St. 152 stating: "disc bright red above, with all the plates white".

Ophiuroglypha tumida, Mortensen

Ophiura (*Ophiuroglypha*) *tumida*, Mortensen, 1933. *Echinoderms of South Africa.* Papers from Dr Th. Mortensen's Pacific Exped., LXV (Vid. Medd. Dansk Naturh. Foren., 93), p. 387, pl. xix, figs. 22–23.

St. 436. 20. ix. 30. Off Durban, 416 m. 4 specimens.

Although the plates of the dorsal side of the disk of these specimens are somewhat less tumid than in the typical form there can be no doubt that they belong to this species, the more so as they are from the type locality.

Ophiurolepis carinata (Studer)

Ophiolepis carinata, Studer, 1876. *Über Echinodermen a. d. antarkt. Meere.* Monatsber. Akad. Berlin, 1876, p. 460.

Ophioglypha carinata, Studer, 1883. *Übersicht über die Ophiuriden 'Gazelle'.* Abh. Akad. Berlin, 1882, p. 15, Taf. ii, fig. 7 *a–d*.

O. deshayesi, Lyman, 1882. Sci. Results H.M.S. 'Challenger'. Ophiuroidea, p. 72, pl. vii, figs. 13–15.

Ophiurolepis carinata, Matsumoto, 1917. Monogr. Japanese Ophiuroids, p. 282.

St. 363. 2·5 miles S 80° E of SE point of Zavodovski Island, South Sandwich Islands, 329–278 m. 1 specimen.

This is a large specimen, 21 mm. in diameter of disk; all arms broken off close to the disk. One of the interradii is partly lacking, apparently on account of a wound, which has, however, healed up again. Some Foraminifera are found attached to the disk plates.

This species has separate sexes. The gonads are numerous, arranged in a series along both the adradial and the interradial side of the genital slits; the eggs are small and very numerous. It may thus be concluded with a fair degree of certainty that the species is not viviparous, but probably has a typical *Ophiopluteus* larva.

The occurrence off the South Sandwich Islands of this species, which was hitherto known only from the Kerguelen region, shows that it must be widely distributed in the Antarctic seas.

Ophiurolepis gelida (Koehler)

Ophioglypha gelida, Koehler, 1901. Result. Voyage 'Belgica'. Echinides et Ophiures, p. 17 pl. i, figs. 6–8.

O. gelida, Koehler, 1912. II^e Expéd. Antarct. Française. Echinodermes, p. 102, pl. ix, figs. 4–10, 13–15.

Homalophiura gelida, H. L. Clark, 1915. Cat. Recent Ophiurans, p. 326.

Ophiurolepis gelida, Koehler, 1922. Austral. Antarct. Exped. Echinod. Ophiuroidea, p. 79, pls. lxxxvi, figs. 11–15; lxxxix, figs. 1–14; xc, figs. 1–6.

O. gelida, Koehler, 1923. Swedish Antarct. Exped. Astéries et Ophiures, p. 130.

O. gelida, Mortensen, 1925. *On a small collection of Echinoderms from the Antarctic Sea.* Arkiv för Zoologi, XVII, A, 31, p. 2.

O. gelida, Hertz, 1926. Deutsche Südpolar-Exped. Ophiuroiden, p. 20.

O. gelida, Hertz, 1927. Deutsche Tiefsee-Exped. Ophiuroiden, p. 94.

St. 170. 23. ii. 27. Off Cape Bowles, Clarence Island, 342 m. 1 specimen.

St. 175. 2. iii. 27. Bransfield Strait, South Shetlands, 200 m. 11 specimens.

St. 180. 11. iii. 27. Schollaert Channel, Palmer Archipelago, 160 m. 1 specimen.

St. 187. 18. iii. 27. Neumayr Channel, Palmer Archipelago, 259–354 m. 2 specimens.

St. 190. 24. iii. 27. Bismarck Strait, Palmer Archipelago, 98–130 m. 12 specimens.

St. 363. 26. ii. 30. 2·5 miles S 80° E of SE point, Zavodovski Island, South Sandwich Islands, 329–278 m. 2 specimens.

St. 366. 6. iii. 30. 4 cables S of Cook Island, South Sandwich Islands, 155–322 m. 1 specimen (large).

St. 456. 18. x. 30. 1 mile E of Bouvet Island, 40–45 m. 5 specimens.

St. 599. 17. i. 31. 67° 08′ S, 69° 06′ W, 203 m. 4 specimens.

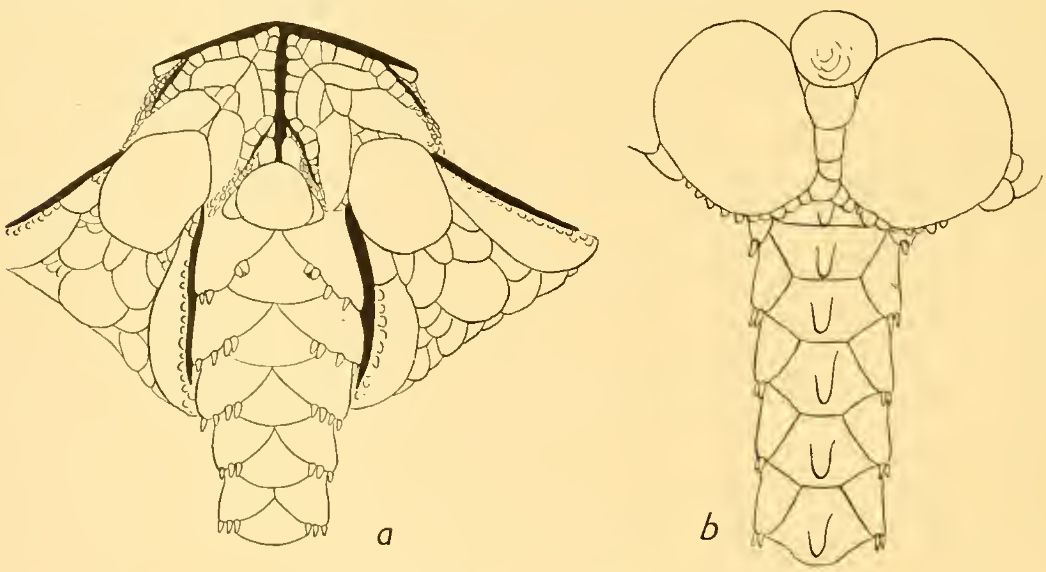


Fig. 36. *Ophiurolepis gelida* (Koehler). *a*, Part of oral side, ×6. *b*, Part of dorsal side, ×8.

As usual in this species the specimens are either covered with a sponge or with Foraminifera. To the specimens from Bouvet Island (St. 456) a number of a *Folliculina* are attached, both on the upper and under side of the disk and on the arms.

The species has separate sexes and is evidently not viviparous. There are two to four gonads on each side of the bursal slits; the eggs are rather numerous, of moderate size, *ca.* 0·3 mm. diameter, all ripening at the same time. The relatively large size of the eggs rather suggests direct development, not through a typical *Ophiopluteus* larva. This, of course, is a mere suggestion.

Ophiurolepis brevirima, n.sp.

(Plate VIII, figs. 8–13)

St. 170. 23. ii. 27. Off Cape Bowles, Clarence Island, 342 m. Several specimens.
St. 172. 26. ii. 27. Off Deception Island, South Shetlands, 525 m. 1 specimen.
St. 175. 2. iii. 27. Bransfield Strait, South Shetlands, 200 m. Several specimens.

Diameter of disk up to *ca.* 20 mm. Arms at most slightly exceeding four times the diameter of disk, but often scarcely as much as three times the diameter.

In larger specimens the disk is usually rather conspicuously elevated, rising from the edge at an angle of *ca.* 45°; but the middle part of the disk is flattened. The primary

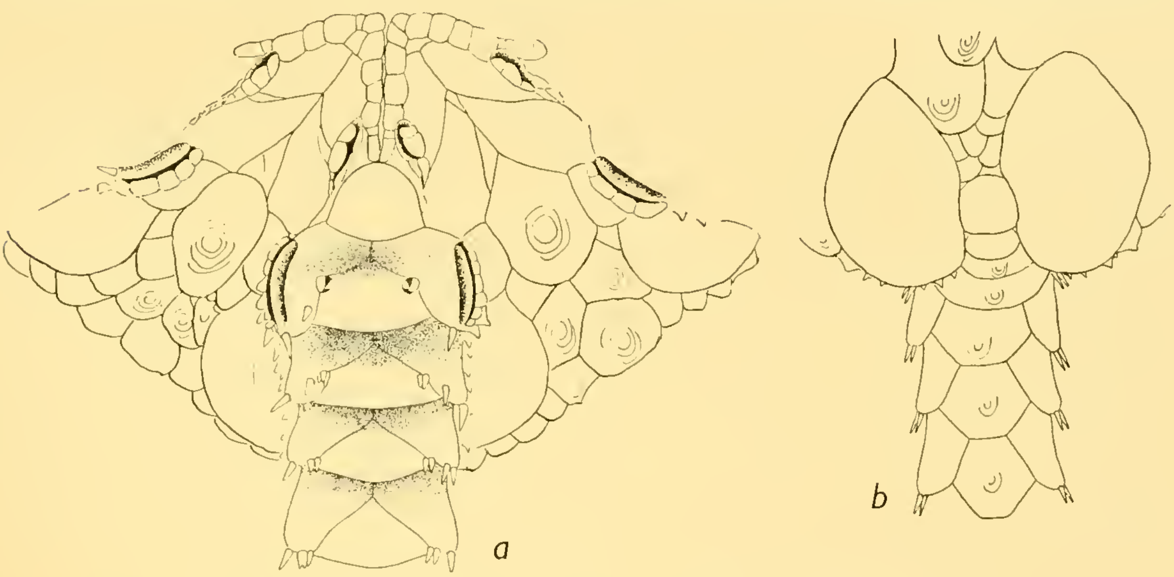


Fig. 37. *Ophiurolepis brevirima*, n.sp. Part of oral side (*a*) and dorsal side (*b*). ×6.

plates are not conspicuous, or even at all discernible, except in the young specimens, and even in these latter they are relatively small. All the plates of the dorsal side of the disk, excepting the radial shields, rise into a low knob surrounded by concentric rings. The radial shields are on the contrary smooth, and even usually somewhat sunken in the middle; they are oval, about half the length of the disk radius, separated by a column of plates, the innermost one of which is generally the most conspicuous. In the ventral interradii the most conspicuous plates are the genital scales, which leave only a rather narrow median space, occupied by some smaller scales, one in the median line being

usually somewhat more prominent. These ventral plates have no elevated knob, but usually show a fairly distinct concentric striation. The buccal plates are small, oval, more or less irregular, sometimes with the proximal part separated off as a distinct small plate. Adoral plates and jaws elongate, oval. Mouth papillae of the usual square shape. First ventral plate large, with a rounded inner edge and a nearly straight outer edge. It is distinctly separated from the second ventral plate; also all the following ventral plates are separated. They have a rather sharp angle proximally, the distal edge being lightly convex or a little produced in the middle. The proximal part of each joint on the ventral side in larger specimens sunken, the distal part correspondingly raised, giving a somewhat ladder-like appearance. The dorsal arm plates about hexagonal, contiguous, each plate rising into a rather sharp central knob, or there may be two or three serrations on the top. The arms on the whole conspicuously keeled, triangular in section. Usually two rather sharp, often somewhat outstanding arm spines, the lower one placed close to the two spine-like tentacle scales, the upper one a little distance above. The genital slits are very short, not extending beyond the end of the first lateral plate; the interradial side of the slit carries about four well-developed, square papillae, the adradial edge is raised into a sharp keel, without indication of papillae. In continuation of the genital slit there are a varying number of small spine-like granules which continue along the sides of the arms to the dorsal side along the distal edge of the radial shields, forming thus a rudimentary arm comb. Colour in alcohol whitish.

All the specimens are covered with a thick, irregular layer of a sponge, which, according to the kind information of Mr Burton, is the same species as that which so often covers *Ophiurolepis gelida*.[1] It often covers the Ophiuran completely, both dorsal and ventral side of both disk and arms, leaving only the mouth and the bursal slits uncovered.

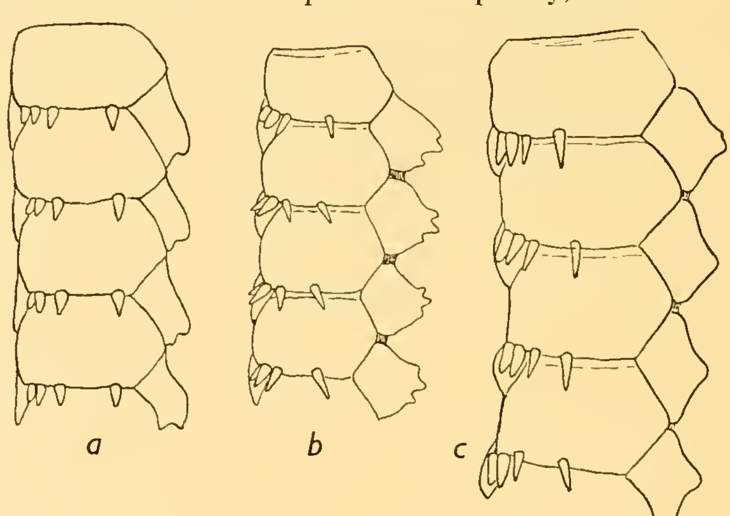


Fig. 38. Part of arm, in side view, of *Ophiurolepis gelida* (*a*) and *O. brevirima* (*b–c*); *b* is from a younger specimen. ×9.

Like *O. gelida* this species has separate sexes and is evidently not viviparous. The gonads are arranged in the same way as in *O. gelida*; the eggs are about the same size as in the latter, and also ripen all at the same time.

It is clear that this species is closely related to *O. gelida*, but is well distinguished from the latter, particularly by its peculiar short genital slits. The shape of the dorsal plates is also a little different; but more important is the fact that the ventral plates are separated

[1] This is generally stated to be *Iophon flabelli-digitatus*, Kirkpatrick. Mr Burton informs me that it is *Iophon radiatus*, Topsent.

in *brevirima*, even in the large specimens, whereas in *gelida* they are contiguous in the proximal part of the arms. Further, the buccal shields are on the whole smaller, and the genital scales larger than in *gelida*, in which latter also the ventral side of the arms is quite flat, not of such a ladder-like appearance as in the present species. The arrangement of the arm spines is also different, the upper spine being placed about at the middle of the lateral plate in *brevirima*, at the upper corner in *gelida*; the spines are a little longer in *brevirima* (Fig. 38 *a–c*). The two species thus must be regarded as quite distinct, but young specimens with the genital slits not yet typically developed are scarcely distinguishable.

O. gelida is thus no longer the only Ophiurid covered by sponge, as it was hitherto supposed to be; and it was even thought that the sponge covering was a sufficiently certain character for recognizing the species (cf. Koehler, Austral. Antarct. Exped., Echinod. Ophiuroidea, p. 81). Very probably the species *brevirima* has sometimes been misidentified as *O. gelida*. Thus when Hertz (Deutsche Südpolar Exped., Ophiuroiden, p. 20) states: "Ich meine sonst zu bemerken, dass stark bewachsene Individuen eine auffallende Höhenentwicklung einzelner Skelettelemente zeigen, z. B. eine Art Aufwülstung der Ränder der Genitalspalten", the suggestion may be made that such specimens were in reality *O. brevirima*.

Ophiurolepis Martensi (Studer)

Ophioglypha Martensi, Studer, 1885. *Die Seesterne Süd-Georgiens.* Jahrb. wiss. Anst. Hamburg, II, p. 161, Taf. ii, fig. 8 *a*, *b*.

Ophiozona inermis, Bell, 1902. Rep. Nat. Hist. Collections. 'Southern Cross'. Echinoderma, p. 217.

Ophioglypha resistens, Koehler, 1911. Brit. Antarct. Exped. 1907–9. Astéries, Ophiures et Echinides, p. 42, pl. vii, figs. 9–12.

Amphiophiura Martensi, H. L. Clark, 1915. Cat. Recent Ophiurans, p. 315.

A. resistens, H. L. Clark, 1915. Cat. Recent Ophiurans, p. 315.

Homalophiura inermis, H. L. Clark, 1915. Cat. Recent Ophiurans, p. 326, pl. xx, figs. 3–4.

Ophiurolepis resistens, Koehler, 1922. Austral. Antarct. Exped. Echinod. Ophiuroidea, p. 74, pls. lxxxvi, figs. 7–10, 18, 19; lxxxviii, figs. 8–10; xc, figs. 7–22.

O. resistens, Koehler, 1923. Swedish Antarct. Exped. Astéries et Ophiures, p. 130.

O. resistens, Hertz, 1926. Deutsche Südpolar-Exped. Ophiuroiden, p. 19.

O. resistens, Grieg, 1929. *Some Echinoderms from the South Shetlands.* Bergens Mus. Årbok, 1929, 3, p. 6.

O. resistens, Grieg, 1929. *Echinodermata from the Palmer Archipelago.* Sci. Results Norwegian Antarct. Exped., II, p. 8.

St. 27. 15. iii. 26. West Cumberland Bay, South Georgia, 110 m. Several specimens.

St. 39. 25. iii. 26. East Cumberland Bay, South Georgia, 179–235 m. 9 specimens.

St. 42. 1. iv. 26. Off mouth of Cumberland Bay, South Georgia, 120–204 m. 15 specimens.

St. 123. 15. xii. 26. Off mouth of Cumberland Bay, South Georgia, 230–250 m. Several specimens.

St. 140. 23. xii. 26. Stromness Harbour to Larsen Point, South Georgia, 122–136 m. Several specimens.

St. 141. 29. xii. 26. East Cumberland Bay, South Georgia, 17–27 m. 1 specimen.

St. 144. 5. i. 27. Off mouth of Stromness Harbour, South Georgia, 155–178 m. 11 specimens.

St. 148. 9. i. 27. Off Cape Saunders, South Georgia, 132–148 m. 3 specimens.
St. 149. 10. i. 27. Mouth of East Cumberland Bay, South Georgia, 200–234 m. 7 specimens.
St. 152. 17. i. 27. 53° 51′ S, 36° 18′ W, South Georgia, 245 m. 1 specimen.
St. 156. 20. i. 27. 53° 51′ S, 36° 21′ W, South Georgia, 200–236 m. 6 specimens.
St. 159. 21. i. 27. 53° 52′ S, 36° 08′ W, South Georgia, 160 m. 4 specimens.
St. 160. 7. ii. 27. Near Shag Rocks, South Georgia, 177 m. 8 specimens.
St. 474. 12. xi. 27. 1 mile W of Shag Rocks, South Georgia, 199 m. Several specimens.
St. 1562. 7. iv. 35. 46° 53′ S, 37° 55′ E, off Marion Island, 88–93 m. Several specimens.
St. 1563. 7. iv. 35. 46° 48′ S, 37° 49′ E, off Marion Island, 113–99 m. Several specimens.
St. 1564. 7. iv. 35. 46° 36′ S, 38° 02′ E, off Marion Island, 110–113 m. 7 specimens.
St. WS 25. 17. xii. 26. Undine Harbour (North), South Georgia, 18–27 m. 1 specimen.
St. WS 27. 19. xii. 26. 53° 55′ S, 38° 01′ W, South Georgia, 107 m. 2 specimens.
St. WS 33. 21. xii. 26. 54° 59′ S, 35° 24′ W, South Georgia, 130 m. 8 specimens.
St. WS 244. 18. vii. 28. 52° 00′ S, 62° 40′ W, Falkland Islands, 253 m. 3 specimens.
St. WS 818. 17. i. 32. 52° 31′ S, 63° 25′ W, 272–278 m. 2 specimens (young).
St. MS 63. 24. ii. 26. East Cumberland Bay, South Georgia, 23 m. 1 specimen.
St. MS 71. 9. iii. 26. East Cumberland Bay, South Georgia, 110–60 m. 12 specimens.

There cannot be the slightest doubt that the above specimens are actually identical with Studer's *O. Martensi*. The original specimens of the latter have been lent me from the Hamburg Museum and I have thus been able to compare them directly with the Discovery specimens; I find them to agree in every respect—a result which could not have been reached from a comparison with the very poor figures given by Studer. But it appears further that Koehler's *Ophioglypha resistens* is also identical with *O. Martensi*, as a comparison of the Discovery specimens with the excellent figures given by Koehler in his two works of 1911 and 1922 shows beyond doubt. (It is of interest in this connection that Koehler identified the specimens from South Georgia of the Swedish South Polar Expedition as *O. resistens*, *op. cit.*, 1923.) By this I do not mean to say that I feel convinced that all the specimens described by Koehler under the name of *O. resistens* are really *O. Martensi*. On the contrary, I feel rather inclined to think that e.g. the specimen figured in pl. vii, fig. 9 (*op. cit.*, 1911), with the pronounced elevation on the dorsal arm plates is in reality *O. gelida*; at least I have not found anything similar in any of the numerous specimens in the present collection. Also the fact that none of the present specimens exceed a size of *ca.* 10 mm. in diameter of disk, whereas Koehler's largest specimens were 12–14 mm., indicates the probability that different species have been mixed up with *O. resistens*. Unfortunately, the original specimens of *O. resistens* are not in the collection of the British Museum, so that I have been unable to make sure whether they all belong to the same species. But the figures 11–12, pl. vii (*op. cit.*, 1911) agree completely with *O. Martensi*, and thus even though there may be more than one species in the original lot of specimens, it is certain that the name *resistens* becomes a synonym of *Martensi*. We have here a natural explanation of the fact that the littoral species of South Georgia, *O. Martensi*, has never been recorded since it was first described; as a matter of fact, it is one of the commonest Ophiuroids of South Georgia. I think it further beyond doubt that Bell's *Ophiozona inermis*, from Cape Adare, Victoria Land ('Southern Cross') is identical with *O. Martensi*. From Bell's "descrip-

tion" nothing can be concluded, of course. But the excellent figures given by Clark (*op. cit.*, 1915), evidently from a co-type, agree perfectly with *O. Martensi*, so that it seems quite safe to conclude that they are identical. This also accounts for the fact that *O. inermis* has never again been recorded.

The specimens from St. WS 818 are very young and the identification not altogether certain; but those from St. WS 244 are adult and quite typical, so that the occurrence of the species as far north as the Falkland Islands is beyond doubt.

The species is viviparous, but apparently *not* hermaphrodite. I have found males only among the smaller specimens, 4–5 mm. diameter. In no case was there any indication

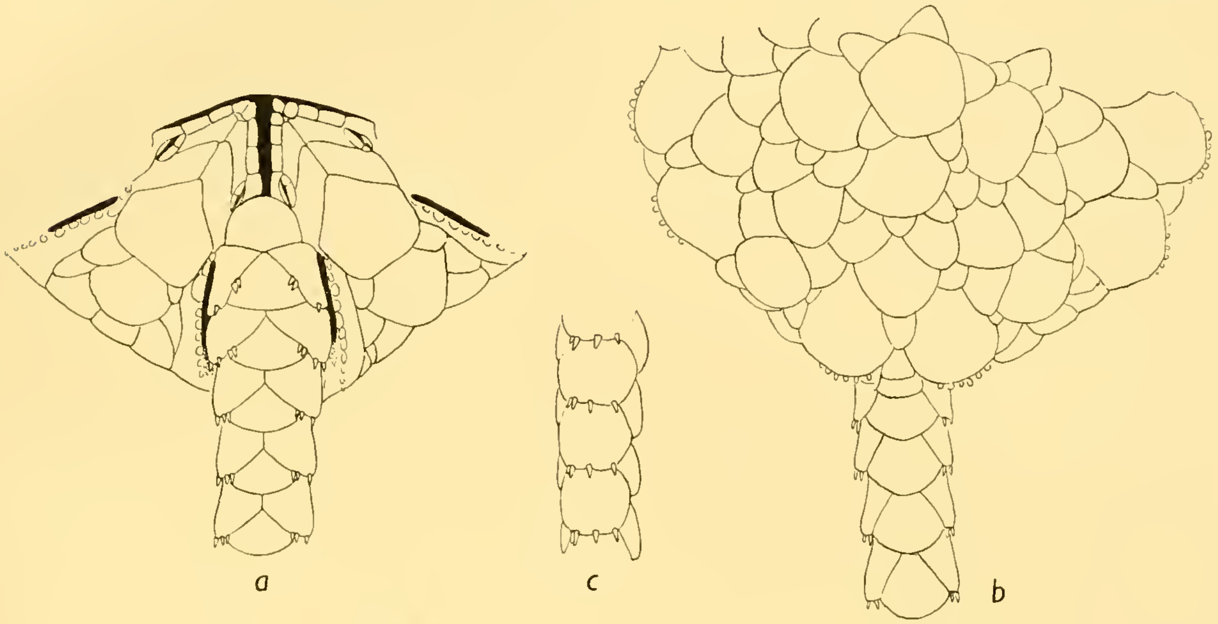


Fig. 39. *Ophiurolepis Martensi* (Studer). Part of oral side (*a*) and dorsal side (*b*). Part of arm in side view (*c*). ×12.

of young eggs developing within the testes, or of spermatozoa within the female gonads, so that the species evidently has separate sexes. There are usually two gonads at the interradial, one or two at the adradial side of the bursal slits. I have found five to six young ones, all in the same stage of development, in each bursa. In specimens containing large young ones the disk is quite swollen, almost hemispherical, as Koehler describes and figures it (*op. cit.*, 1922, p. 78, pl. lxxxviii *g*), though without suspecting the cause of it.

O. Martensi was not hitherto known from off Marion Island or from anywhere in the Kerguelen region.

In contradistinction to *O. gelida* this species is never covered with sponges, very rarely a single Foraminifer may be found to have attached itself upon it. Concentric rings, so characteristic of *O. gelida*, are never distinct on the disk plates.

Ophiurolepis Wallini, Mortensen

Ophiurolepis Wallini, Mortensen, 1925. *On a small collection of Echinoderms from the Antarctic Sea.* Arkiv för Zoologi, XVII, A 31, p. 3.

St. 160. 7. ii. 27. Near Shag Rocks, South Georgia, 177 m. 1 specimen.
St. 187. 18. iii. 27. Neumayr Channel, Palmer Archipelago, 259 m. 2 specimens.
St. 190. 24. iii. 27. Bismarck Strait, Palmer Archipelago, 130 m. 1 specimen.

To the original description of this species I would only add that the jaws are generally distinctly sunken in the middle, there being thus a circle of five rather conspicuous depressions round the mouth, just as in *Ophiurolepis partita*. None of the present specimens in hand have any of the ventral arm-plates divided, as was the case in the type specimen.

The species appears to have separate sexes and not to be viviparous, like *O. partita*. Two of the specimens were opened and both were found to be females. There are one or two gonads at the interradial, and one at the adradial side of the genital slit. The eggs are few and rather large, exactly as in *O. partita*.

On the whole, this species is closely related to *O. partita*, from which it is distinguished mainly by the character of the dorsal arm-plates, which are undivided in the present species.

It would appear further that Koehler's *Ophioglypha frigida* (Result. Voyage 'Belgica', Echinides et Ophiures, p. 16, pl. v, figs. 31–3) is also a close relation of the present species. I even had a suspicion that they might be identical; having, however, had an opportunity of seeing the type of *O. frigida* in the Brussels Museum and of comparing it with a specimen of *O. Wallini* that I had brought with me, I had to recognize that the two species are distinct.

Furthermore, it seems evident that the *Amphiophiura relegata*, described by Koehler in his report on the Ophiuroids of the Australasian Antarctic Expedition (p. 57, pl. lxxxviii, figs. 1–7) must also be nearly related to *O. Wallini* and *partita*. This sounds rather remarkable, since Koehler refers this species to quite a different genus, *Amphiophiura*. However, I think Koehler is mistaken in placing the species in this genus. Judging from his photographic figures—unfortunately very poor—it agrees very much more with *O. Wallini* and *partita*.[1] By this I do not mean to say that the species *relegata* should be transferred to the genus *Ophiurolepis*. As a matter of fact, I rather doubt whether all these species ought properly to be referred to the genus *Ophiurolepis*. I am strongly inclined to think that they ought to form a separate genus, differing from the typical *Ophiurolepis* in the much better developed ambulacral pores, and further characterized by the total absence of papillae at the base of the arms. I shall, however, refrain from establishing such a genus at present, as it could hardly be done properly without a complete revision of the large and difficult *Ophiurolepis-Homalophiura*

[1] After this report was sent to press I received from the Australian Museum, Sydney, a cotype of Koehler's *Amphiophiura relegata*. Comparison with the types of *Ophiurolepis Wallini* shows that these two species are, indeed, very closely related, though apparently distinct.

group, for which I have no time. I would emphasize, however, that the species mentioned are not better included in the genus *Homalophiura*, which is likewise characterized by its much reduced ambulacral pores—there being, indeed, some doubt whether *Homalophiura* can be maintained as a separate genus from *Ophiurolepis*.

Ophiurolepis partita (Koehler)

Ophioglypha partita, Koehler, 1908. Scott. Nat. Antarct. Exped. Astéries, Ophiures et Echinides, p. 595, pl. x, figs. 94–5.
Homalophiura partita, H. L. Clark, 1915. Cat. Recent Ophiurans, p. 327.

St. 180. 11. iii. 27. 1·7 miles W of N Point of Gand Island, Schollaert Channel, Palmer Archipelago, 160–330 m. 2 specimens.
St. 182. 14. iii. 27. Schollaert Channel, Palmer Archipelago, 278–500 m. 4 specimens.
St. 187. 18. iii. 27. Neumayr Channel, Palmer Archipelago, 259–354 m. 3 specimens.
St. 190. 24. iii. 27. Bismarck Strait, Palmer Archipelago, 130 m. 2 specimens.

The largest of the present specimens has a diameter of disk of 7 mm., whereas the type specimen from the 'Scotia', the only specimen hitherto found, was 10 mm. in

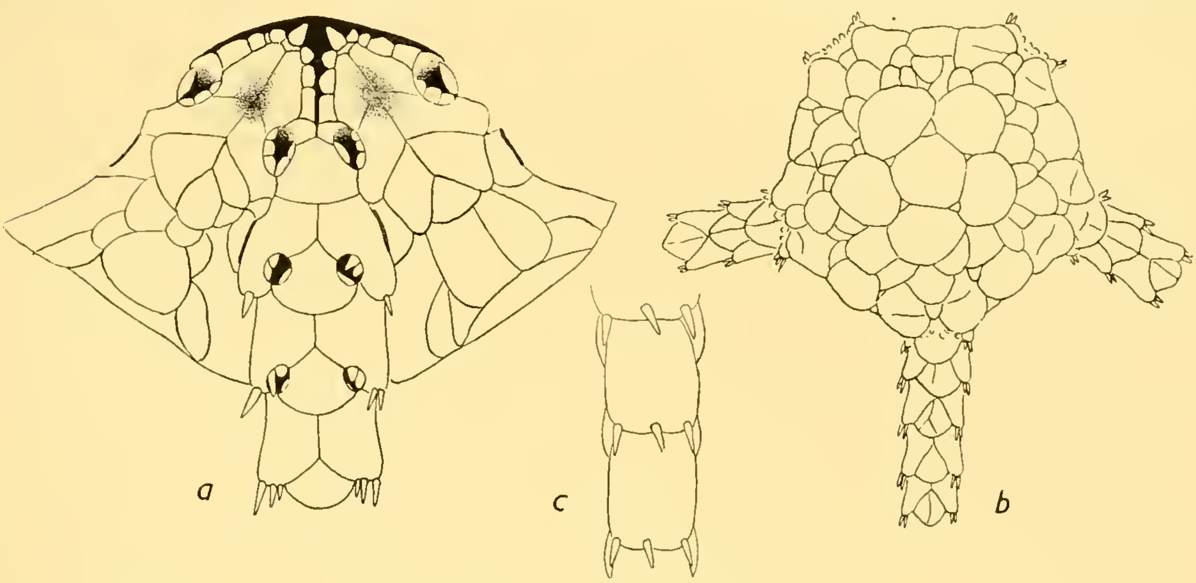


Fig. 40. *Ophiurolepis partita* (Koehler). Part of oral side (*a*). ×18. Dorsal side (*b*). ×9. Part of arm, side view (*c*). ×18.

diameter. This larger size may account for the conspicuous difference noted in the size of the primary disk plates, these being represented in Koehler's pl. x, fig. 94, as quite small, widely separated by a considerable number of small plates, whereas in the present specimens they are much larger, separated by only a few small plates, or even contiguous. The shape of the radial shields is also somewhat different from that shown in the figure quoted. They may be irregularly subdivided (Fig. 40 *b*). Koehler states that the plates of the disk are "très fortement granuleuses". This is rather exaggerated, conveying the impression that they are covered with separate granules, which they are not. It is only the usual calcareous substance of the plates which is rather coarse, giving the surface of the plates a more or less conspicuous granular appearance.

A marked feature of this species, not mentioned by Koehler, is that the jaws are usually distinctly sunken in the middle, there being thus five conspicuous depressions round the mouth. The two specimens from St. 180 have the dorsal arm-plates undivided, and one of them has also the buccal shields entire. As they otherwise agree with the remaining specimens, particularly in regard to the tentacle pores, I have no doubt that they belong to the same species, *O. partita*.

The species has separate sexes, and would seem not to be viviparous. There are one to three gonads at each genital slit, placed interradially, and one or none adradially. The ovaries contain a small number, about three to six, large yolky eggs *ca.* 0·3 mm. in diameter. Three of the specimens contain a very remarkable, large, parasitic Crustacean, probably a Copepod (? *Ophioika*). It does not castrate its host. On the specimens from St. 182 are further found some small Gymnoblastic Hydroids, probably identical with the *Hydractinia vallini* described by Jäderholm (*Über einige antarktische u. subantarktische Hydroiden.* Arkiv för Zoologi, XVIII A, No. 14, 1926, p. 2) from *Ophiurolepis Wallini*.[1] The type specimen was taken in the neighbourhood of the South Orkneys, at a depth of 3195 m.

Ophiurolepis turgida, n.sp.

St. WS 871. 1. iv. 32. 53° 16′ S, 64° 12′ W, 336–341 m. 1 specimen.

Diameter of disk 10 mm., arms scarcely three times that length, rather robust. Disk flat, covered with moderately large, flat scales, among which the primary plates are only little prominent. Radial shields small, oval, scarcely one-third of the disk radius; they are narrowly separated distally, widely divergent proximally. Ventral interradii with a moderate number of rather thick plates; genital scales not very broad. Buccal shields rounded with a rather acute angle within, the point of which may be separated off as a separate small plate. Adoral plates narrow, slightly narrower than the jaws. Mouth papillae of the usual square shape. First ventral plate large, rounded proximally, with a low peak distally. The following two to three plates narrowly contiguous or nearly so; they are of the usual, nearly triangular form. Dorsal arm-plates rather broadly contiguous, with a low, wart-like prominence distally. Lateral plates somewhat swollen, carrying two small, rudimentary spines, one near the tentacle scales, the other nearer the upper edge, though some distance therefrom. Tentacle pores and scales rudimentary, as typical of *Ophiurolepis*. Genital slits very small and narrow, not proceeding beyond the first lateral plate; there are some few low, wart-like papillae along their interradial edge, these papillae continuing along the sides of the arms to the edge of the disk and along the outer edge of the radial shields. Colour of the single dried specimen white.

This species appears to be the nearest related to *O. anceps*, Koehler, which has also quite short genital slits. But the much thicker and more swollen plates of the disk and arms of *O. anceps* prove that they cannot be identical; the shape of the buccal shields and of the first ventral arm-plate is also quite different in the two species. From

[1] A related species, *Hydractinia* (*Stylactis*) *ingolfi*, found on *Homalophiura tessellata* (Verrill), was described by Dr Kramp in the report on the Hydroids of the Godthaab Expedition 1928, in Meddelelser om Grønland, 79, 1, 1932, p. 13: cf. Mortensen, 'Ingolf' Ophiuroids, p. 92, pl. iii, fig. 17.

Homalophiura inornata, with similar short genital slits, it differs in the plates being much thicker—there is even a slight indication of such thickenings as are so characteristic of *O. gelida*—besides other characters (cf. Fig. 42 *a*, *b*). (That the species *inornata* is referred to the genus *Homalophiura* while the present species is referred to the genus *Ophiurolepis* does not mean that they are essentially different, since the genus *Homalophiura* probably cannot be maintained as distinct from *Ophiurolepis*, see below, p. 329.)

On the whole, I think the only possible course is to regard the specimen described above as representing a separate species.

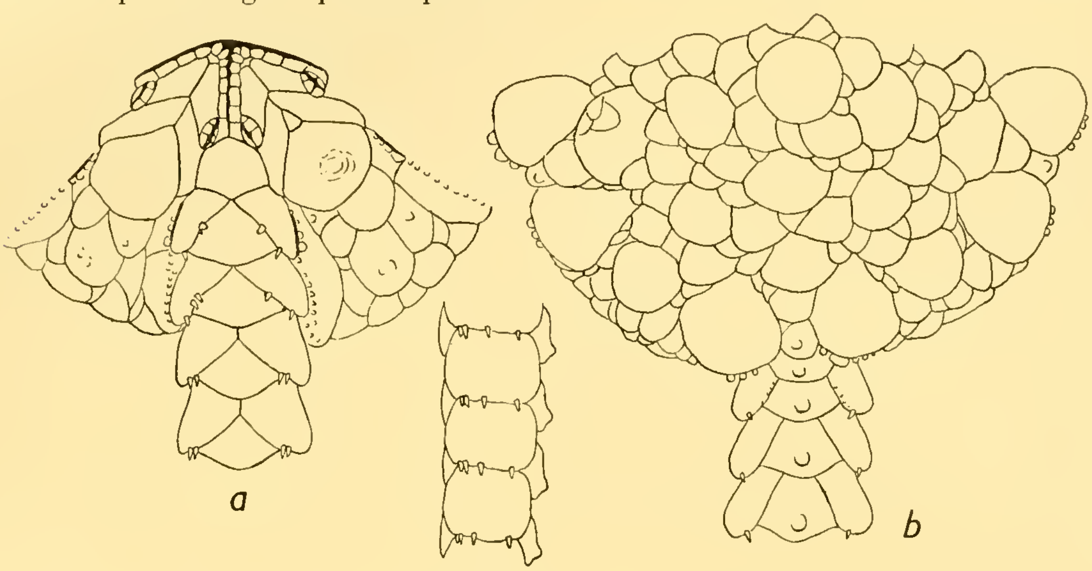


Fig. 41. *Ophiurolepis turgida*, n.sp. Part of oral side (*a*) and dorsal side (*b*). Part of arm in side view (*c*). ×8.

Homalophiura inornata (Lyman)

(Plate VIII, figs. 4–5)

Ophioglypha inornata, Lyman, 1882. Sci. Results H.M.S. 'Challenger'. Ophiuroidea, p. 73, pl. iii, figs. 10–12.

? *O. divisa*, Lütken and Mortensen, 1899. 'Albatross' Ophiuroids, p. 127, pls. iv, figs. 10–12; v, figs. 1–2.

O. inornata, Koehler, 1904. Siboga-Exped. Ophiuroidea, I, p. 40.

O. inornata, Koehler, 1906. Ophiures du 'Travailleur' et du 'Talisman', p. 262.

Homalophiura inornata, H. L. Clark, 1915. Cat. Recent Ophiurans, p. 326.

H. inornata, Koehler, 1922. *Ophiurans of the Philippine Seas*. Bull. U.S. Nat. Mus., 100, 5, p. 387, pl. 82, fig. 9.

St. WS 212. 30. v. 28. 49° 22′ S, 60° 10′ W, 242–249 m. 3 specimens.
St. WS 236. 6. vii. 28. 46° 55′ S, 60° 40′ W, 272–300 m. 4 specimens.
St. WS 819. 17. i. 32. 52° 42′ S, 62° 39′ W, 312–329 m. 4 specimens.
St. WS 820. 18. i. 32. 52° 53′ S, 61° 51′ W, 351–367 m. 3 specimens.
St. WS 821. 18. i. 32. 52° 56′ S, 60° 55′ W, 461–468 m. Several specimens (in very poor condition).
St. WS 839. 5. ii. 32. 53° 30′ S, 63° 29′ W, 403–439 m. 1 specimen.

Nearly all the specimens from St. WS 821 have the buccal plates or the dorsal arm-plates, or both, irregularly divided. The specimens from the other stations have both buccal plates and dorsal arm-plates undivided. The great variation which exists on this point in the present species has been repeatedly emphasized by Koehler (*op. cit.*).

An important fact is to be noted in this species—or at least in the present specimens—viz. that the genital slits are quite short, not extending beyond the first lateral plate. But in continuation of the genital slit there are, in the larger specimens, a number of flat, irregularly arranged granules (recalling to some degree genital papillae) (Fig. 42*a*). This has an important bearing on the question of the identity of these specimens with Lyman's *Ophioglypha inornata* and with Lütken and Mortensen's *Ophioglypha divisa.* Both these species are represented as having long genital slits, continuing to the edge of

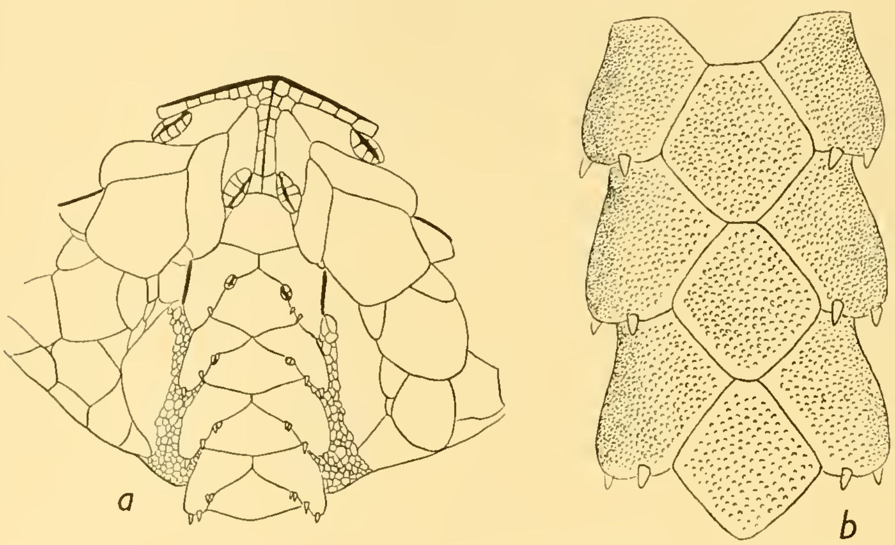


Fig. 42. *Homalophiura inornata* (Lyman). Part of oral side (*a*). ×6. Part of arm, dorsal side, of type specimen (*b*). ×20.

the disk. If that be correct, the present specimens are not identical with them, and must then represent a distinct species. Lately I had an opportunity of examining the type specimen of Lyman's *Ophioglypha inornata* in the British Museum. I find the genital slits to be quite short, not proceeding beyond the first lateral plate, but, as in the present specimens, there are some granules along the sides of the arms in continuation of the genital slits. Pl. III, fig. 10 of the Challenger Ophiuroidea is therefore erroneous in regard to the genital slits, and thus far the Antarctic specimens agree with Lyman's *inornata*. There is, however, one noteworthy difference. In the type of *inornata* the plates of the disk and arms have a peculiar coarsely granulated appearance (Fig. 42 *b*), whereas in the Antarctic specimens the plates are quite smooth. If this proves to be a constant difference between the Atlantic-Pacific specimens of *inornata* and those from the Antarctic seas, the latter should evidently form at least a separate variety.

As for *O. divisa*, Lütken and Mortensen, maintained by Koehler to be identical with *H. inornata*, I have no specimens of that species, so I cannot ascertain whether it has actually long genital slits as represented in pl. iv, fig. 10 and pl. v, fig. 1 of the Albatross Ophiuroidea. On applying to my friend Professor H. L. Clark, who has a couple of co-types of *O. divisa* in the Museum of Comparative Zoology, he kindly informs me that, having carefully compared these specimens with the figures quoted, he does "not think there is any reason to criticize these figures". Both specimens have the slits very tightly closed, so it is difficult to feel sure how long the slits are; but there is little doubt that they do go to the margin. After this I think it very doubtful whether *O. divisa* is really identical with *O. inornata*; at least, I cannot agree that such identity has as yet been proved.

H. inornata was not hitherto known from Antarctic seas; but with its (apparently) cosmopolitan distribution it is not surprising that it has now been found to occur, not only in the Magellanic region, but even so far south as the South Shetlands. The smallest depth from which it was hitherto known was 470 m.

The species has separate sexes and is not viviparous. There are numerous gonads along both sides of the bursae. The eggs are rather large and yolky, apparently not ripening all at a time. One of the specimens from St. 363 carries a number of specimens of a species of *Loxosoma*.

Hertz (Deutsche Südpolar-Exped., Ophiuroiden, p. 18) has pointed out the difficulty of distinguishing the genera *Homalophiura* and *Ophiurolepis* (and *Ophioplinthus*) and thinks that *Homalophiura* can scarcely be maintained. I rather think so too; however, this question cannot be settled without a very extensive study of all these forms, which would be out of place here; and as the species *inornata* is the genotype of *Homalophiura*, I shall retain that name for the present.

Homalophiura inornata, var. tuberosa, n.var.

St. 175. 2. iii. 27. Bransfield Strait, South Shetlands, 200 m. 1 specimen.

St. 363. 26. ii. 30. 2·5 miles S 80° E of SE Point of Zavodovski Island, South Shetlands, 329–278 m. 4 specimens.

These specimens on the whole agree very well with the above specimens of *H. inornata*, but they differ so markedly from them in the dorsal arm-plates that they must be designed as a separate variety. These plates are very small, separated and conspicuously thickened, so as to form the appearance of a series of small warts along the dorsal side of the arm. Also the plates of the disk are somewhat thicker than usual in the species.

Although this character of the dorsal arm-plates is rather a striking feature, I do not think it sufficient for a specific character, the more so as there is some variation in its development; the largest specimen from St. 363 has it so much less pronounced than the others that it may rather be designated simply as *inornata*; the one next in size is more intermediate. I shall therefore designate it only as a variety of *H. inornata*.

It may be mentioned that here and there a dorsal plate is seen to be irregularly divided; the buccal plates are also irregularly divided, as is so often the case in this species.

It may not be superfluous to state that the variety has separate sexes like the typical form; this is evident from the fact that the one specimen opened was found to be a ripe male.

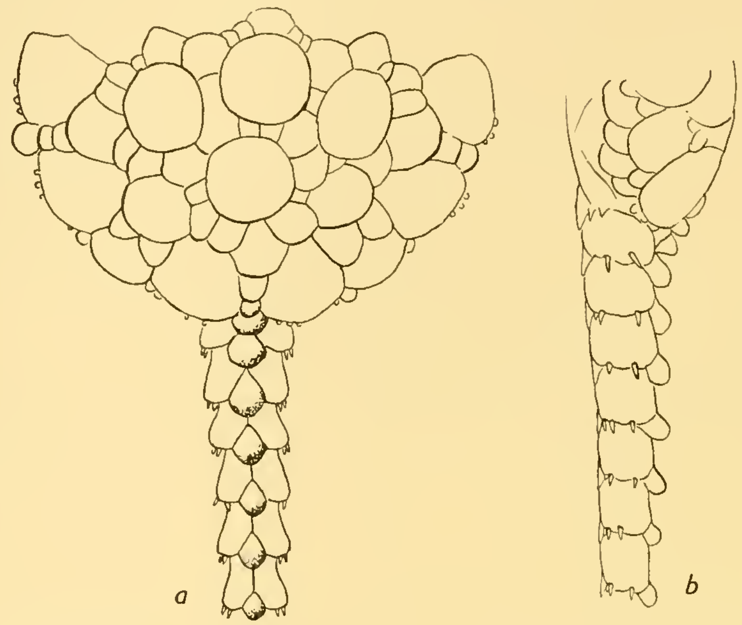


Fig. 43. *Homalophiura inornata*, var. *tuberosa*, n.var. Part of dorsal side (*a*); part of arm and disk, side view (*b*). ×10.

Ophiura meridionalis (Lyman)

Ophioglypha meridionalis, Lyman, 1879. *Ophiuridae and Astrophytidae of the 'Challenger'*. Part II. Bull. Mus. Comp. Zool., VI, p. 56, pl. xvi, figs. 447–9.

O. meridionalis, Lyman, 1882. Sci. Results H.M.S. 'Challenger'. Ophiuroidea, p. 40.

Ophiomastus rotundus, G. A. Smith, 1923. *Rep. Echinoderms of the 'Quest'*. Ann. Mag. Nat. Hist., 9 Ser., XII, 372.

St. 27. 15. iii. 26. West Cumberland Bay, South Georgia, 110 m. 8 specimens.

St. 39. 25. iii. 26. East Cumberland Bay, South Georgia, 179–235 m. 2 specimens.

St. 42. 1. iv. 26. Off mouth of Cumberland Bay, South Georgia, 120–204 m. 4 specimens.

St. 123. 15. xii. 26. Off mouth of Cumberland Bay, South Georgia, 230–250 m. Several specimens.

St. 126. 19. xii. 26. 53° 58′ S, 37° 08′ W, South Georgia, 100–0 m. 2 specimens.

St. 140. 23. xii. 26. Stromness Harbour to Larsen Point, South Georgia, 122–136 m. 10 specimens (young).

St. 144. 5. i. 27. Off mouth of Stromness Harbour, South Georgia, 155–178 m. 2 specimens.

St. 148. 9. i. 27. Off Cape Saunders, South Georgia, 132–148 m. 2 specimens.

St. 152. 17. i. 27. 53° 51′ S, 36° 18′ W, South Georgia, 245 m. 3 specimens.

St. 156. 20. i. 27. 53° 51′ S, 36° 21′ W, South Georgia, 200–236 m. 5 specimens.

St. 160. 7. ii. 27. Near Shag Rocks, South Georgia, 177 m. 7 specimens.

St. WS 33. 21. xii. 26. 54° 59′ S, 35° 24′ W, South Georgia, 130 m. 1 specimen.

St. WS 212. 30. v. 28. 49° 22′ S, 60° 10′ W, N of Falkland Islands, 242–249 m. 1 specimen.

St. MS 71. 9. iii. 26. East Cumberland Bay, South Georgia, 110–60 m. 7 specimens, and a number of very young specimens, the identification of which is uncertain.

There can be no doubt that these specimens are identical with the *Ophiomastus rotundus* of G. A. Smith, likewise from South Georgia, though differing in some minor points from Smith's description.

This identity was fully confirmed by the examination of one of Smith's original specimens, sent me for examination from the British Museum. Smith's statement that there are three arm spines up to the seventh joint, then four, must be due to some mis-

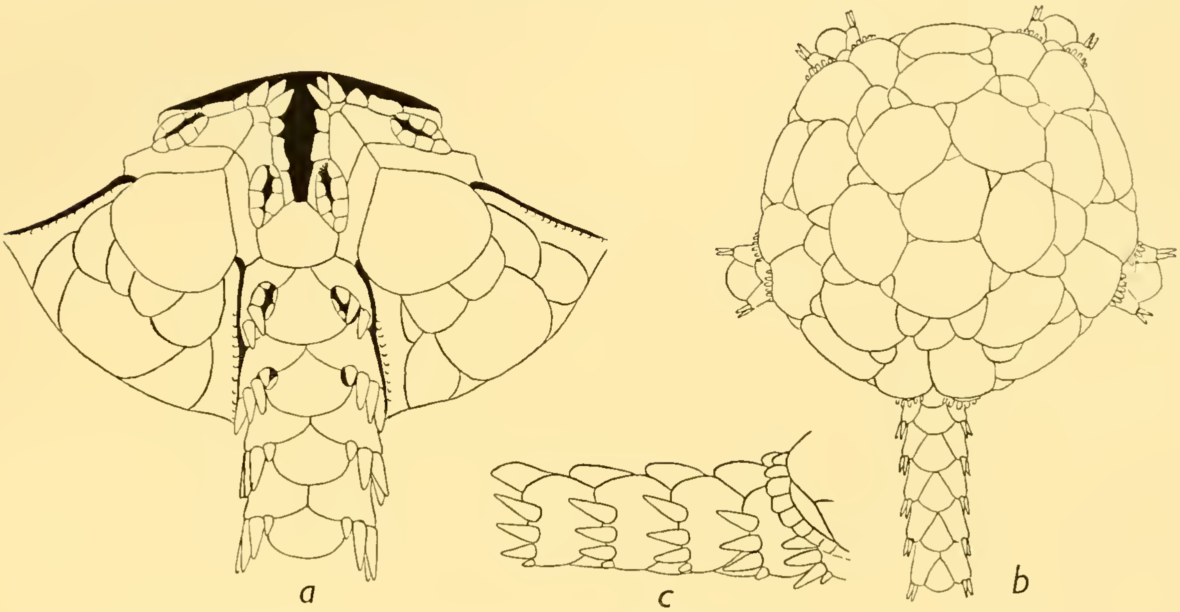


Fig. 44. *Ophiura meridionalis* (Lyman). Part of oral side (*a*), ×18; dorsal side (*b*), ×10. Proximal part of arm, side view (*c*). ×18.

take. My specimens, as well as the co-type sent me, have only three spines throughout; only quite exceptionally have I occasionally found four spines on a joint. It may be remarked that the upper spine is generally slightly the largest.

Not being able to see from extant descriptions and figures how this *Ophiomastus rotundus* could be distinguished from Lyman's *Ophioglypha meridionalis* from off La Plata, I applied to the British Museum for the loan of one of the original specimens of *O. meridionalis*, which was very kindly granted me. The result of the comparison of the two species is that there can be no doubt of their identity. As seen from Figs. 44, 45 there is some slight difference in the arrangement of the scales of the disk, the five primary radial plates being replaced by an irregular circle of eight plates in the type of *meridionalis*; this is, however, quite evidently an anomaly, and an exactly similar arrangement may be found in some of the specimens from South Georgia, though by far the majority of them have a regular circle of five primary radials. On the ventral side and on the arms no difference exists between *Ophiomastus rotundus* and *Ophiura*

meridionalis. Accordingly *Ophiomastus rotundus* is synonymous with *Ophiura meridionalis* (Lyman), which is thus distributed from off La Plata to South Georgia. The fact that there is only one specimen from off the Falkland Islands (St. WS 212) whereas there is a good number of specimens from various places off South Georgia, seems to indicate that the centre of distribution of the species is in the South Georgian area.

I do not think this species can be referred to the genus *Ophiomastus*; the long genital slits and the existence of well developed arm combs are characters which do not conform with *Ophiomastus*, but with *Ophiura*, to which latter genus this species properly belongs. The tentacle scales are also markedly different from those of typical *Ophiomastus.*

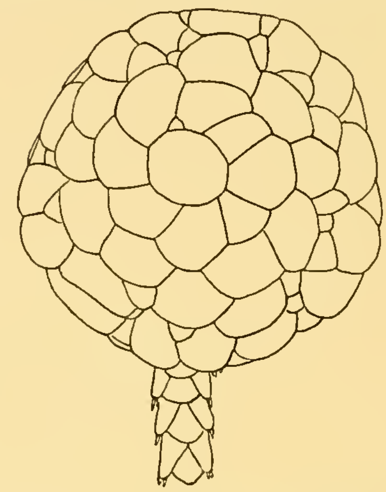


Fig. 45. *Ophiura meridionalis* (Lyman). Type specimen. Dorsal side. ×12·5.

None of the present specimens exceed a size of 6 mm. in diameter of disk, which thus appears to be the maximum size. *The species is viviparous and hermaphrodite.* The male gonads are found at the adradial side of the bursae and sometimes also at the interradial side, distally. The number of the gonads, male and female, varies to some extent, but generally there are only one or two of each at each bursa. The eggs are of the usual large size, *ca.* 0·3–0·4 mm., and there are only few of them; I have found only some six to eight embryos or eggs in each bursa. In no specimen were young ones found ready to leave the bursa, only such as had the skeleton in an incipient stage. Some of the specimens are infested by a curious Crustacean parasite, probably a Copepod (? *Ophioika*). It does not castrate its host.

It may be pointed out that there is some variation in regard to the tentacle scales of the second pore pair; generally there is only one tentacle scale here, as at the following pores, but not rarely there are two scales, at both sides of the pore. The specimen figured is unusual in having two scales at one pore, only one at the other. The disk is often conspicuously swollen, almost hemispherical, recalling to some degree that of *Ophiopyrgus.* The edge of the disk is usually rather sharp, marking the limit between the flat underside and the more or less elevated dorsal side.

Ophiura Rouchi (Koehler)

(Plate VIII, figs. 6, 7)

Ophioglypha Rouchi, Koehler, 1912. II[e] Expéd. Antarct. Française. Echinodermes, p. 107, pl. ix, figs. 11–12.

Ophiura Rouchi, Koehler, 1922. Austral. Antarct. Exped. Echinod. Ophiuroidea, p. 52, pl. lxxxv, figs. 1–2.

O. Rouchi, Hertz, 1926. Deutsche Südpolar-Exped. Ophiuroiden, p. 23.

St. 195. 30. iii. 27. Admiralty Bay, King George Island, South Shetlands, 391 m. 4 specimens.

To Koehler's excellent description of this species I have only to add that the uppermost arm spine is a little distant from the two others. The present specimens otherwise agree perfectly with Koehler's description and figures. The largest specimen is 7·5 mm. in diameter of disk, thus exceeding somewhat the largest size hitherto recorded, 6 mm. diameter of disk.

This species is viviparous but *not* hermaphrodite. Of two specimens opened one, 7 mm. in diameter, proved to be a female, with some ten young embryos in each bursa, all in the same stage of development, with the primary disk plates and the terminals recognizable; the other, 5 mm. in diameter, was a male. In both sexes two to three gonads were found at the interradial side, one to two at the adradial side of the bursa.

I quite agree with Koehler (*op. cit.*, 1922) that this species does not properly belong to the genus *Homalophiura*, to which it was referred by H. L. Clark (Cat. Recent Ophiurans, p. 327), but to the genus *Ophiura*, s.str.

Ophiura flexibilis, var. crassa, n.var.

St. 170. 23. ii. 27. Off Cape Bowles, Clarence Island, 342 m. 1 specimen.

This specimen in general corresponds with *O. flexibilis* (Koehler), but differs from it in the plates of the disk being smaller and more numerous than in the typical form; the

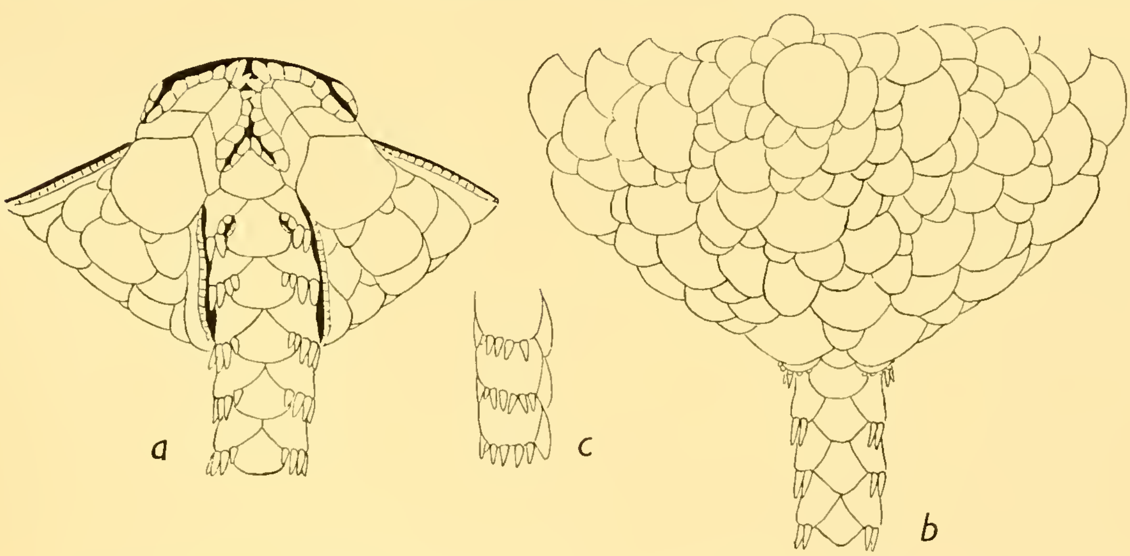


Fig. 46. *Ophiura flexibilis*, var. *crassa*, n.var. Part of oral side (*a*) and dorsal side (*b*); part of arm in side view (*c*).

ventral arm-plates are somewhat shorter and broader, and contiguous on the three proximal joints. The arms also are somewhat more robust than in the typical *flexibilis*. Quite exceptionally there may be five, instead of four, arm spines.

As the specimen is rather large, 8 mm. diameter of disk, it is quite possible that the differences pointed out are in the main due to age (I have no specimens of *flexibilis* of a corresponding size for comparison), and since the differences are rather unimportant, I do not think it desirable to make this single specimen the type of a separate species,

but prefer to designate it as a variety (it cannot be referred to any of the other known species of *Ophiura* from Antarctic seas).

Concerning the sexual character of the variety, as well as the typical *flexibilis*, I can only state that the eggs are of the usual large size, *ca.* 0·2–0·3 mm., and rich in yolk; but whether the species, or the variety, is viviparous or not cannot be decided from the scanty material at hand.

Ophiura serrata, n.sp.

St. 175. 2. iii. 27. Bransfield Strait, South Shetlands, 200 m. 4 specimens.
St. 195. 30. iii. 27. Admiralty Bay, King George Island, South Shetlands, 391 m. 1 specimen.

Diameter of disk 5·5 mm. Arms all broken, but apparently not more than about three times the disk diameter. They are triangular in section, the underside quite flat, the dorsal side keeled, but the keel is not sharp.

Dorsal side of disk rather flat, covered by large flat, imbricating scales, among which the primary plates are very conspicuous, forming in the younger specimens a very regular rosette. With age the primary plates evidently become separated by some smaller plates. Radial shields contiguous distally or nearly so. Ventral interradii with few, irregular plates, one in the middle, outside the buccal shield, somewhat larger than the others. Buccal shield rounded, with a small peak within. Adoral and oral plates of the usual shape. Mouth papillae three to four on each side of jaw, of the usual square shape. First ventral plate large, pentagonal, with convex outer edge. Second ventral plate scarcely in contact with the first, the following plates widely separated. Dorsal arm-plates rounded hexagonal in the proximal part of arm, gradually becoming longer and separated, pointed proximally and with the outer edge convex. The lateral plates, which are hardly at all swollen, carry three rudimentary, equal-sized and equidistant spines, at most the upper one slightly removed from the others. Only the two first pores well developed; from the third there are two small tentacle scales, from about the fifth only one. Genital slits well developed, reaching to the edge of the disk, with fairly well developed papillae along the genital scales; arm combs very little developed, at most two to three small papillae being visible from above. Colour of dried specimens whitish.

A conspicuous feature is found in the dorsal arm plates. They are separated by a rather deep furrow, which causes the dorsal outline of the arm as seen in profile to be a low serration, the plate itself being quite flat in outline (Fig. 47 *c*).

As regards the sexual characters of this species I can give no information beyond the fact that in one of the specimens, an interradius of which was opened, I found the gonads to contain only very few young, yolky eggs; it appeared that they would probably grow to the usual rather large size. Whether the species is viviparous cannot be ascertained from such poor evidence.

The specimen from St. 195 is somewhat larger, 7 mm. diameter of disk, and has some more small plates on the disk, the primary plates being wholly separated. The dorsal arm-plates are somewhat different in outline from those of the typical form (Fig. 47 *d*), and the lateral plates are rather distinctly swollen. Otherwise it agrees with the typical

form. From the sparse material at hand it is, of course, impossible to tell whether this represents a separate variety or is perhaps more typical of the species than the (younger) form here designated as the type. But, however this may be, the specimens from St. 175 are all alike, and it thus seemed more reasonable to select the largest of them as the type, instead of the single specimen from St. 195.

Though in no way a very marked form, I do not see that it can be referred to any known species of *Ophiura*.

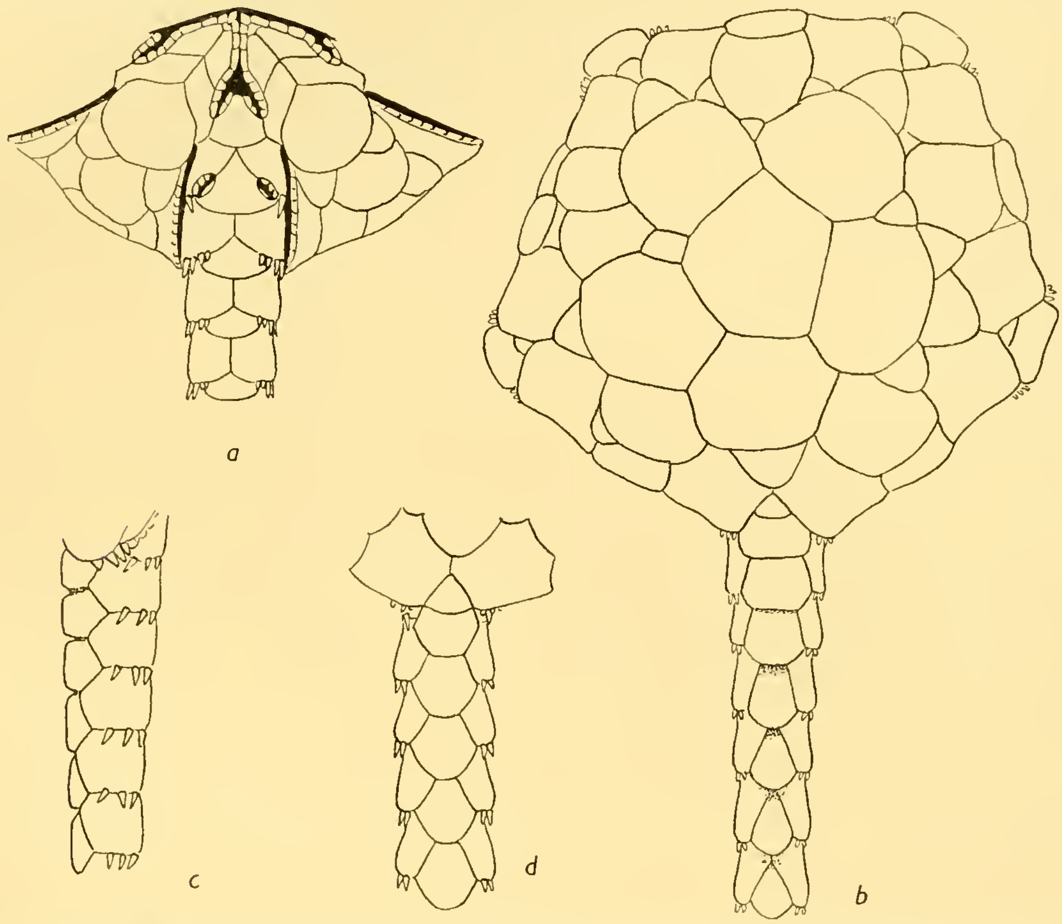


Fig. 47. *Ophiura serrata*, n.sp. Part of oral side (*a*); dorsal side (*b*). Part of arm, side view (*c*). Proximal part of arm, dorsal side, with radial shields, of specimen from St. 195 (*d*). All ×12·5.

Ophiocten amitinum, Lyman

(Plate VIII, fig. 2)

Ophiocten amitinum, Lyman, 1882. Sci. Results H.M.S. 'Challenger'. Ophiuroidea, p. 79, pl. ix, figs. 7–9.

O. amitinum, Studer, 1885. *Übersicht über die Ophiuriden der 'Gazelle'*. Abh. Akad. Berlin, 1882, p. 16, Taf. ii, fig. 8 *a–f*.

O. amitinum, Ludwig, 1899. Ophiuriden Hamburger Magalh. Sammelreise, p. 4.

O. amitinum, H. L. Clark, 1923. *Echinoderm Fauna of South Africa*. Ann. S. African Mus., XIII, p. 363. (Var. *simulans*, Mortensen.)

O. amitinum, Koehler, 1923. Swedish Antarct. Exped. Astéries et Ophiures, p. 122.
O. amitinum, Mortensen, 1933. *Echinoderms of South Africa*. Papers from Dr Th. Mortensen's Pacific Exped., LXV (Vid. Medd. Dansk Naturh. Foren., 93), p. 390. (Var. *simulans*, Mortensen.)

St. 91. 8. ix. 26. Off Roman Rock, False Bay, South Africa, 35 m. 1 specimen (type of var. *simulans*, n.var.).
St. 159. 21. i. 27. 53° 52′ S, 36° 08′ W, 160 m. 1 specimen.
St. 160. 7. ii. 27. Near Shag Rocks, South Georgia, 177 m. 12 specimens.
St. 474. 12. xi. 30. 1 mile W of Shag Rocks, South Georgia, 199 m. 10 specimens.
St. WS 93. 9. iv. 27. 7 miles S 80° W of Beaver Island, West Falkland Islands, 133 m. 2 specimens.
St. WS 99. 19. iv. 27. 49° 42′ S, 59° 14′ W, 251 m. 1 specimen.
St. WS 210. 29. v. 28. 50° 17′ S, 60° 06′ W, 161 m. Numerous young specimens.
St. WS 211. 29. v. 28. Same locality as St. WS 210. Numerous young specimens.
St. WS 212. 30. v. 28. 49° 22′ S, 60° 10′ W, 242 m. Numerous young specimens.
St. WS 213. 30. v. 28. Same locality as St. WS 212. Numerous young specimens.
St. WS 214. 31. v. 28. 48° 25′ S, 60° 40′ W, 208 m. Numerous young specimens.
St. WS 215. 31. v. 28. 47° 37′ S, 60° 50′ W, 219 m. Several young specimens.
St. WS 216. 1. vi. 28. Same locality as St. WS 215. Numerous young specimens.
St. WS 227. 12. vi. 28. 51° 08′ S, 56° 50′ W, 320 m. 5 specimens.
St. WS 229. 1. vii. 28. 50° 35′ S, 57° 20′ W, 210 m. Several specimens.
St. WS 231. 4. vii. 28. 50° 10′ S, 58° 42′ W, 167–159 m. Several young specimens.
St. WS 233. 5. vii. 28. 49° 25′ S, 59° 45′ W, 185–175 m. Numerous young specimens.
St. WS 234. 5. vii. 28. 48° 52′ S, 60° 25′ W, 195 m. Several young specimens.
St. WS 235. 6. vii. 28. 47° 56′ S, 61° 10′ W, 155 m. Several young specimens.
St. WS 236. 6. vii. 28. 46° 55′ S, 60° 40′ W, 272 m. Several young specimens.
St. WS 237. 7. vii. 28. 46° 00′ S, 60° 05′ W, 150 m. Numerous young specimens.
St. WS 244. 18. vii. 28. 52° 00′ S, 62° 40′ W, 253 m. Several young specimens.
St. WS 248. 20. vii. 28. 52° 40′ S, 58° 30′ W, 210–242 m. 1 specimen.
St. WS 748. 16. ix. 31. 53° 41′ S, 70° 55′ W, 300 m. 2 specimens.
St. WS 766. 18. x. 31. 44° 58′ S, 60° 05′ W, 545 m. 4 specimens, young.
St. WS 772. 30. x. 31. 45° 13′ S, 60° 00′ W, 162–309 m. 5 specimens, young.
St. WS 773. 31. x. 31. 47° 28′ S, 60° 51′ W, 291–296 m. Very numerous young specimens.
St. WS 781. 6. xi. 31. 50° 30′ S, 58° 50′ W, 148 m. 1 specimen.
St. WS 782. 4. xii. 31. 50° 28′ S, 58° 30′ W, 141–146 m. 8 specimens, in poor condition.
St. WS 783. 5. xii. 31. 50° 03′ S, 60° 10′ W, 155–159 m. Numerous young specimens.
St. WS 784. 5. xii. 31. 49° 48′ S, 61° 05′ W, 164–170 m. 7 specimens.
St. WS 818. 17. i. 32. 52° 31′ S, 63° 25′ W, 272–278 m. 2 specimens.
St. WS 819. 17. i. 32. 52° 42′ S, 62° 39′ W, 312–329 m. 1 specimen.
St. WS 824. 19. i. 32. 52° 29′ S, 58° 27′ W, 137–146 m. *ca.* 20 specimens, in poor condition.

The very numerous young specimens (by the hundred thousand) bear witness to the excellent food conditions that must exist in Falkland seas; it seems beyond doubt that this Ophiurid must be a factor of considerable importance in the ecology and economy of these seas.

Plate VIII, fig. 2, represents a photo of a live specimen; it is stated to have the "upper side of disc deep purplish brown, with white plates; arms deep brown above". Some few of the preserved specimens still show distinct traces of this coloration.

That this species is not viviparous has already been pointed out by Ludwig (*op. cit.*); I may add that it has, as was to be expected, separate sexes.

The specimen from St. 191, False Bay, South Africa, cannot simply be identified with the South American specimens of *Ophiocten amitinum*. It differs from the latter in the character of the arm comb, in the arms being more distinctly carinate, and in the colour, the arms being distinctly banded, with alternating white and dark, brownish bands. The more important difference is in the arm comb. In the South African form the comb continues downwards, along the genital slit, which it does not do in the South American form; further there is a distinct inner comb, whereas in the South American form there is no such distinct inner comb (Fig. 48 *a*, *b*).

In my Echinoderms of South Africa (*loc. cit.*) I pointed out the close resemblance between this South African form and the North Atlantic *Ophiura affinis*, Lütken. As a

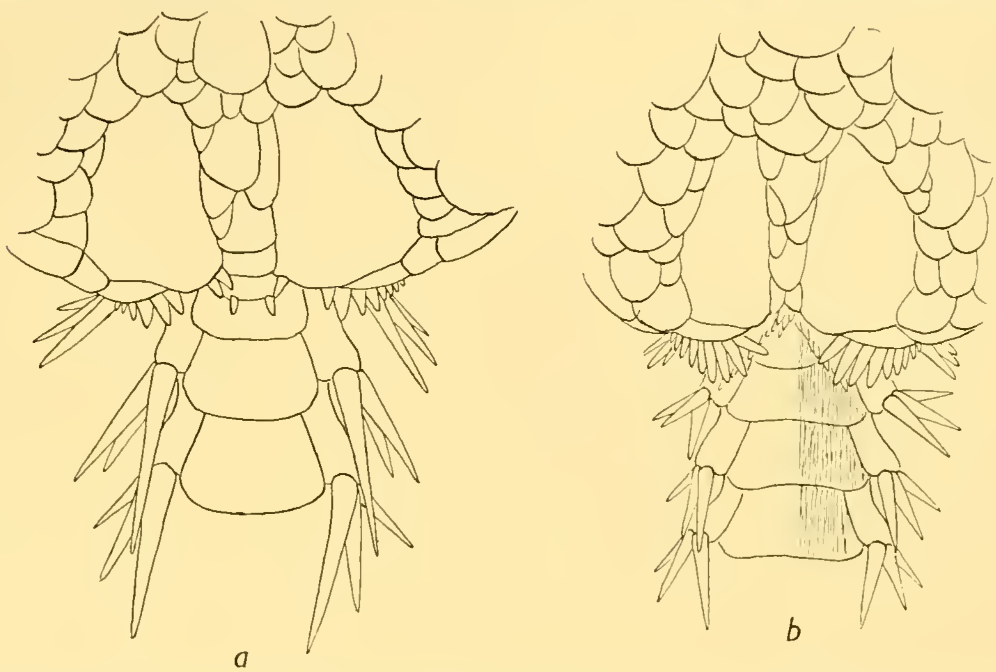


Fig. 48. Part of dorsal side of *Ophiocten amitinum*, Lyman (*a*) and of the var. *simulans*, n.var. (*b*). *a* is from a specimen 6 mm. in diameter of disk, *b* from a specimen 5·5 mm. in diameter. ×22·5.

matter of fact, I do not see how they can be distinguished, and I am very much tempted to regard the South African "*Ophiocten amitinum*" as identical with *Ophiura affinis*. I do not do so here for two reasons; first, because I have not seen any specimen of *Ophiocten amitinum* from the type locality, off Kerguelen—perhaps the Kerguelen specimens will prove to differ from those from South America and be more like the South African form; and then we do not know *O. affinis* from the West African Coast, unless the *Ophiocten africanum* of Koehler should prove to be identical with *affinis* (in my Echinoderms of South Africa, p. 391, I have expressed the opinion that it is more nearly related to the Mediterranean *O. Grubei*, Heller). In view of these uncertainties I think it preferable for the present to designate the South African form as a variety of *Ophiocten amitinum*, var. simulans, n.var.

Ophiocten dubium, Koehler

Ophiocten dubium, Koehler, 1901. Result. Voyage 'Belgica'. Echinides et Ophiures, p. 20, pl. vi, figs. 40–1.
O. dubium, Koehler, 1912. IIe Expéd. Antarct. Française. Echinodermes, p. 129.
O. dubium, subsp. *gaussense*, Hertz, 1926. Deutsche Südpolar-Exped. Ophiuroiden, p. 15, Taf. ii, figs. 4–5.

St. 170. 23. ii. 27. Off Cape Bowles, Clarence Island, 342 m. 1 specimen.
St. 190. 24. iii. 27. Bismarck Strait, Palmer Archipelago, 130 m. 2 specimens.

These are perfectly typical specimens of this remarkable *Ophiocten*. The specimen from St. 170 is adult, 9 mm. in diameter of disk. It is a ripe male, full of large testes; this shows the species to have separate sexes and to be, in all probability, non-viviparous. The specimens from St. 190 are young, 3–5 mm. in diameter of disk.

I do not think the subspecies *gaussense* of Hertz valid. The character on which it is based, eight arm spines, instead of nine to ten in the typical form, and somewhat longer than in the latter, is quite unimportant, and no doubt subject to a good deal of variation, as is usually the case in Ophiurids with numerous spines. Since only a very small number of specimens of this species have as yet been recorded, twelve in all, it seems unjustifiable to establish a separate subspecies on this character.

Ophiocten bisquamatum, n.sp.

St. 42. 1. iv. 26. Off mouth of Cumberland Bay, South Georgia, 120–204 m. 3 specimens.
St. 140. 23. xii. 26. Stromness Harbour to Larsen Point, South Georgia, 122–136 m. 1 specimen.
St. 152. 17. i. 27. 53° 51′ S, 36° 18′ W, South Georgia, 245 m. 1 specimen.

Diameter of disk of largest specimen 3·5 mm. Arms broken, but apparently not more than *ca.* 12–15 mm. in length. The disk is flattened, but the edge is rather high, rounded, not at all sharp as in most species of *Ophiocten*. There is usually a large, circular central plate which is somewhat eccentric (one of the specimens has no central plate). The disk is otherwise covered by rather large, imbricating plates, among which the primary plates are not distinct. Along the edges of the plates are found some very small, slightly elevated scales, like very low, nearly flat granules. The radial shields are distinctly broader than long, contiguous distally or wholly separated. The disk scales on the whole are exceedingly thin and delicate, looking dark (transparent) in the middle, whitish along the edges, where they imbricate. The ventral interradii show only some few small plates outside the large, squarish, rounded buccal shields. Mouth papillae four at each side of the jaw, the proximal ones pointed.

First ventral plate large, polygonal, with convex distal edge. The second ventral plate contiguous with the first, the third nearly contiguous with the second, the following ones widely separated. All the ventral plates with strongly convex distal edge. Dorsal arm-plates rectangular, with outer edge convex; they are distinctly longer than broad, and broadly contiguous. Three arm spines, the uppermost one the longest, only little longer than an arm joint in the proximal part of the arm. Tentacle scales at the first pore pair one at the adradial, three at the interradial side; the outer one of the three latter is elongate, spine-like, the others more leaf-shaped. The following pores have two, some-

times three, spine-like tentacle scales, continuing at least till the middle of the arm, the inner one then gradually becoming smaller and disappearing. The tentacle scales are very like the lower arm spines, and not much shorter, so that it is not easy to tell which are spines and which tentacle scales. The genital slits are wide, with the merest indication of papillae distally. Arm comb consisting only of three or four papillae at the distal edge of the radial shields. No papillae across the base of the arms or along the distal edge of the first dorsal arm plates. Colour of the dried specimens whitish.

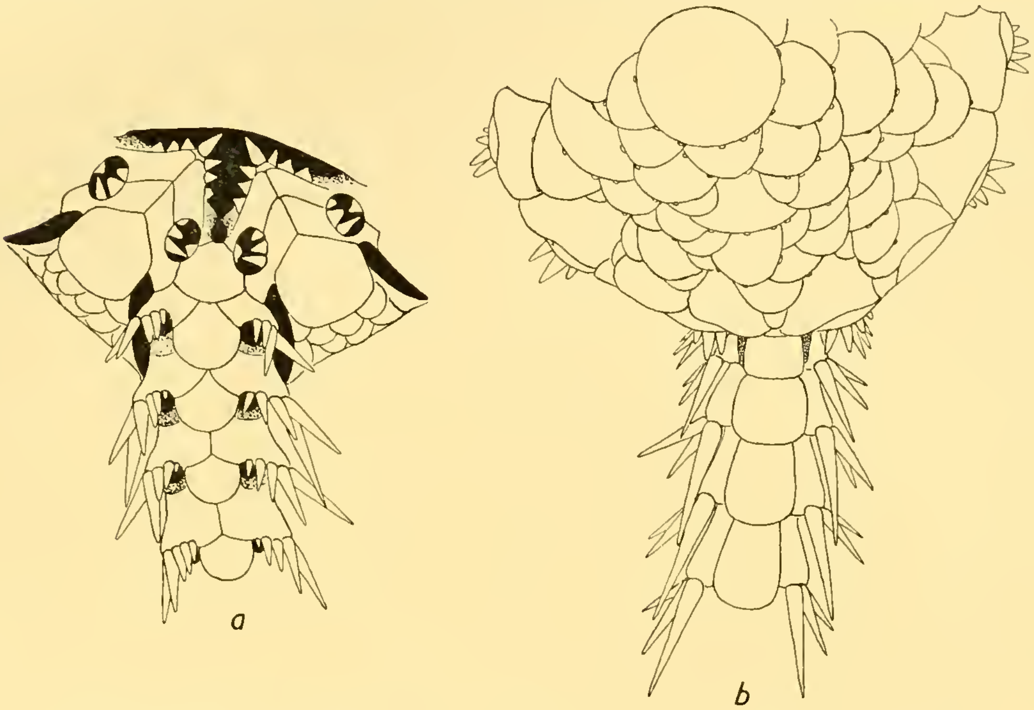


Fig. 49. *Ophiocten bisquamatum*, n.sp. Part of oral (*a*) and dorsal side (*b*). ×22·5.

This is an interesting species, recalling by its large, eccentric central plate *O. megaloplax*, Koehler, with which it also agrees in the shape of the dorsal arm-plates. The small granules of the disk recall *O. dubium*; but in the character of the tentacle scales it stands quite apart from the other known species of *Ophiocten*.

On the sexual characters I can give no information. On opening an interradius of the largest specimen I found no genital organs developed, which seems to indicate that none of the specimens are adult.

I may take the opportunity here of stating that *Ophiocten megaloplax* has separate sexes and is not viviparous.

Dictenophiura anoidea, H. L. Clark

Dictenophiura anoidea, H. L. Clark, 1923. *Echinoderm Fauna of South Africa*. Ann. S. African Mus., XIII, p. 361, pl. xix, figs. 1–2.

Ophiura carnea, Hertz, 1927. Deutsche Tiefsee-Exped. Ophiuroiden, p. 69 (*Non: Ophiura carnea*, M. Sars).

Dictenophiura anoidea, Mortensen, 1933. *Echinoderms of South Africa*. Papers from Dr Th. Mortensen's Pacific Exped., LXV (Vid. Medd. Dansk Naturh. Foren., 93), p. 388.

St. 91. 8. ix. 26. Off Roman Rock, False Bay, South Africa, 35 m. 3 specimens.

Dictenophiura Skoogi (Koehler)

Ophiura Skoogi, Koehler, 1923. *Sur quelques Ophiures des côtes de l'Angola et du Cap.* Göteborg. K. Vet. Vitterhets-Samhälles Handlingar, xxv, 5, p. 11, figs. 10–11.

Dictenophiura Skoogi, Mortensen, 1933. *Echinoderms of South Africa.* Papers from Dr Th. Mortensen's Pacific Exped., LXV (Vid. Medd. Dansk Naturh. Foren., 93), p. 390, fig. 87 *b*.

St. 279. 10. viii. 27. Off Cape Lopez, French Congo, 58–67 m. 15 specimens.

There can be no doubt that these specimens are identical with Koehler's *Ophiura Skoogi*. Another question is whether this *O. Skoogi* differs really so much from the North Atlantic *O. carnea* that it can reasonably be regarded as a separate species. Koehler (*op. cit.*, p. 14) points out quite a number of characters in which *O. Skoogi* differs from *O. carnea*. But I do not think a single one of them holds good, except, perhaps, that the radial shields are in general slightly larger in *O. Skoogi* than in *carnea*. The only noticeable difference I find is that the lateral plates are more swollen in *Skoogi* than in *carnea*, and also that the dorsal arm-plates are somewhat more swollen in the former. In my Echinoderms of South Africa I have given a figure showing that the buccal shields are considerably elongated in *O. Skoogi*, but this is no constant feature; there is so much variation in the size of the buccal shields that in this respect no reliable difference between *Skoogi* and *carnea* (and *anoidea*) can be found. In the work cited above I have further stated that *O. Skoogi* differs from both *carnea* and *anoidea* in the primary disk plates being "wholly surrounded by small plates", which they are not in the two other species. This is a mistake, partly in Koehler's description, which states that these plates are "separées les unes des autres par une rangée de petites plaques", partly in Koehler's fig. 11, which apparently shows the large plates each surrounded by a circle of smaller plates. They are not so; but all the plates, in the specimens preserved in alcohol, are darker in the centre, a broad edge appearing whitish. This produces the effect seen in Koehler's fig. 11. The same feature is also observable in both *carnea* and *anoidea*.

There thus remain, as the only characters distinguishing *O. Skoogi* from *carnea*, the more swollen dorsal and lateral arm-plates, and in addition the slightly larger radial shields, characters rather insufficient for specific distinction. I think that this form from the tropical coast of West Africa represents merely a variety of the North Atlantic *carnea*, which latter is recorded from as far south as the Cape Verde Islands. Before, however, the specific value of *O. Skoogi* is finally decided I think it desirable to have specimens from the north-west coast of Africa for comparison, and for this reason I shall for the present keep it as a separate species.

It may be added that this species (or variety) has separate sexes and is not viviparous, as holds good also of *O. carnea* and *anoidea*.

Amphiophiura Rowetti, G. A. Smith

Amphiophiura Rowetti, G. A. Smith, 1923. *Report on the Echinoderms coll. during the voyage of H.M.S. 'Quest'*. Ann. Mag. Nat. Hist., 9 Ser., XII, p. 370.

St. 20. 4. iii. 26. 14·6 miles N 41° E of Cape Saunders, South Georgia, 200 m. 1 specimen.
St. 27. 15. iii. 26. West Cumberland Bay, South Georgia, 110 m. 3 specimens.
St. 42. 1. iv. 26. Off mouth of Cumberland Bay, South Georgia, 120–204 m. 3 specimens.

St. 45. 6. iv. 26. 2·7 miles S 85° E of Jason Light, South Georgia, 238–270 m. 1 specimen.

St. 126. 19. xii. 26. 53° 58′ S, 37° 08′ W, South Georgia, 100 (–0) m. 1 specimen.

St. 140. 23. xii. 26. Stromness Harbour to Larsen Point, South Georgia, 122–136 m. 1 specimen (young).

St. 156. 20. i. 27. 53° 51′ S, 36° 21′ W, South Georgia, 200–236 m. 8 specimens (young).

St. 363. 26. ii. 30. 2·5 miles S 80° E of SE point of Zavodovski Island, South Sandwich Islands, 329–278 m. 1 specimen.

St. WS 33. 21. xii. 26. 54° 59′ S, 35° 24′ W, South Georgia, 130 m. 2 specimens.

Although G. A. Smith in describing this species omitted to give a figure of the oral side, I can have no doubt that the present specimens belong to that species, the more so as they come from the type locality, off South Georgia. One point alone would seem to be in contradiction to the description given by Smith, viz. the mouth shields, which are stated by Smith to be very large, occupying the whole of the interbrachial area on the

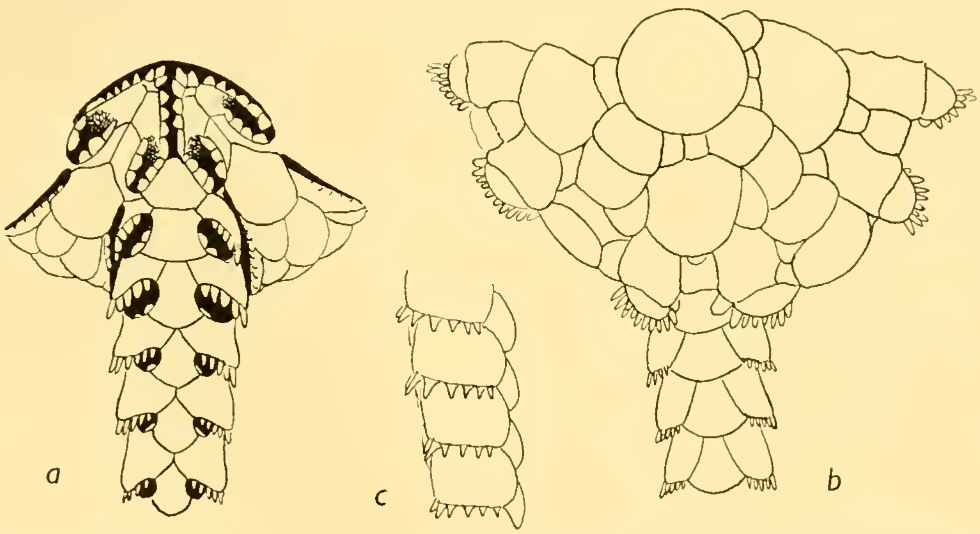


Fig. 50. *Amphiophiura Rowetti*, G. A. Smith. Part of oral side (*a*) and dorsal side (*b*); part of arm in side view (*c*). ×15.

ventral surface. The figure of the oral side given here is not in accordance with this statement; it shows the buccal shields rather small, occupying only the proximal half of the ventral interradius. There is, however, much variation in this respect, some of the other specimens having the buccal shields relatively larger, so as to cover more or less completely the whole ventral interradius; this depends to a great extent on the state of contraction of the interradius of the specimen (due to food content or the sexual state at the time of capture—and also, of course, to age, the younger specimens having these plates relatively larger). There is no possibility of distinguishing more than one species from the character of the mouth shields.

It may be mentioned that none of the spines in the distal part of the arms are transformed into hooks, such as are described by Hertz (Deutsche Tiefsee-Exped., Ophiuroiden, pp. 77–9) for *A. concava*, Hertz, and *A. trifolium*, Hertz.

The specimen from St. 363 (South Sandwich Islands) must, I think, likewise be referred to this species, in spite of the fact that the dorsal arm-plates are somewhat more

swollen than in the specimens from South Georgia. As, however, there is only one young specimen, 4 mm. in diameter of disk, from that station, I give this identification with some reserve.

This species is viviparous and hermaphrodite. There is one sausage-shaped testis at the adradial side of the bursa, sometimes also a second smaller one proximal to the large one. There is one female gonad at the interradial side of the bursa, with only one egg developing at a time, and it is almost certain that the development is intra-ovarial; the developing eggs are large, 0·5 mm. in diameter.

Amphiophiura gibbosa, n.sp.

St. 175. 2. iii. 27. Bransfield Strait, South Shetlands, 200 m. 3 specimens.

Diameter of disk of the largest specimen 6·5 mm., the arms rather stout, *ca.* 18 mm. in length, thus about three times the diameter of the disk. Disk covered by rather coarse

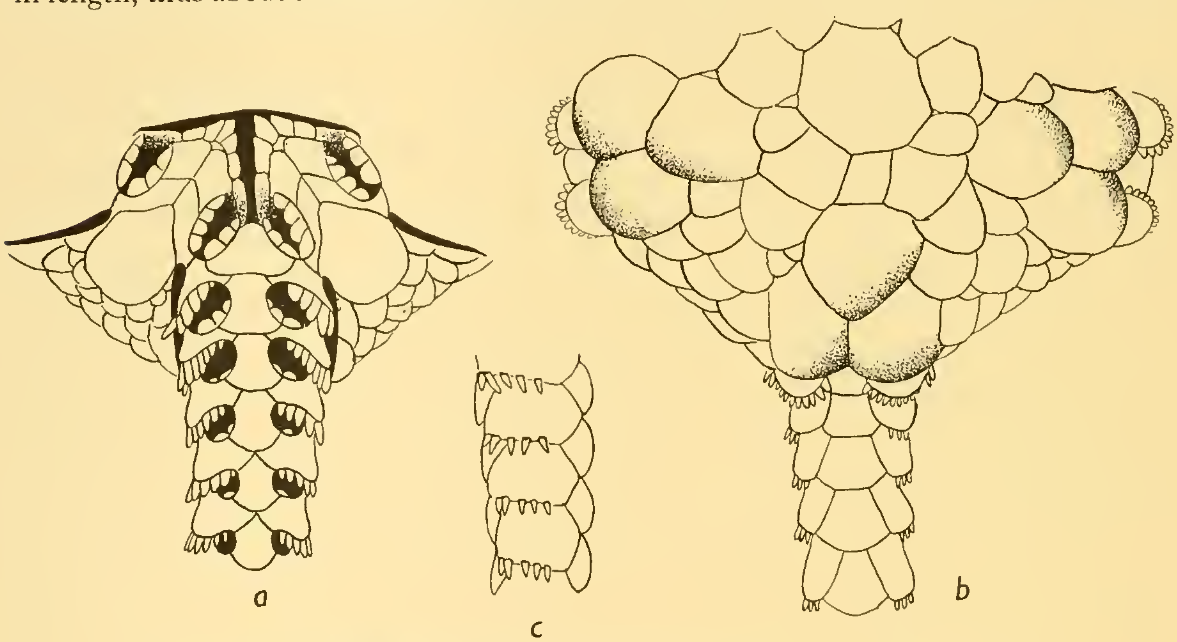


Fig. 51. *Amphiophiura gibbosa*, n.sp. Part of oral side (*a*) and dorsal side (*b*). Part of arm in side view (*c*). ×12.

scales, among which the polygonal central plate and five primary radial plates are conspicuous, particularly the latter, which form a wedge between the proximal ends of the radial shields.

These primary radial plates, together with the radial shields, are conspicuously elevated, and produce a somewhat gibbous appearance, recalling *Ophiosteira Senouqui*. The radial shields are contiguous in their distal half. In the younger specimens there is a single series of plates in the interradii, in the larger specimen several small plates have been added. No large plate on the edge of the interradii, also the ventral interradii are covered by small plates only, besides the buccal shields, which are fairly large, occupying about half of the interradius. In one case the proximal end of the buccal shield has been separated off as a small plate. Adoral and oral plates (jaws) of about equal size, in the

main flat, simple. Mouth papillae usually three to each side of jaw, of the common type. First ventral plate triangular, conspicuously broader than the following ones, which are of the shape usual in this genus; the three or four proximal ones are contiguous. Dorsal arm plates contiguous in the proximal part of the arms, not much swollen. Arm spines three or four in the proximal part of arms, short, equidistant, none of them transformed into hooks. Arm comb well developed, but the papillae are short, not longer than the arm spines. Papillae along the genital slits rudimentary; the slits reach to the edge of the disk. Tentacle pores large, with numerous scales or papillae, as usual in the genus. Colour of preserved specimens whitish.

The species is *viviparous*. Probably it is also hermaphrodite, like *A. Rowetti*; but this I have been unable to ascertain definitely. Not thinking it desirable to spoil the type specimen, the only one preserved in alcohol, I have only opened one interradius from the ventral side, which showed merely the young embryos (with the skeleton just beginning to develop) lying as in *A. Rowetti*.

The character of the gibbous elevation of the primary radial plates and the radial shields distinguishes this species markedly from *A. Rowetti*, as well as from the other species of *Amphiophiura* known from the Antarctic seas or elsewhere. The species seems the nearest related to *A. Rowetti*, of which it may perhaps ultimately prove to be only a variety.

Ophiomastus conveniens, Koehler

Ophiomastus conveniens, Koehler, 1923. Swedish Antarct. Exped. Astéries et Ophiures, p. 122, pl. xv, figs. 5–6.

O. conveniens, Grieg, 1929. *Echinodermata from the Palmer Archipelago*, p. 10. Sci. Results Norwegian Antarct. Exped., II, p. 10.

St. 181. 12. iii. 27. Schollaert Channel, Palmer Archipelago, 160–335 m. 1 specimen.

The specimen is a young one, 3 mm. in diameter of disk. It is in full accordance with the description and figures given by Koehler, excepting the fact that the proximal arm joints have only three spines, not four, as had Koehler's specimen.

The genital slits have just begun to appear; they are very short, not exceeding one-third the length of the first lateral plate. Whether they will be longer in the adult does not appear from Koehler's description and figures, but the probability is that they remain quite short.

On Koehler's statement that the plates of the disk are covered with a very fine and regular granulation it may be remarked that it is the calcareous structure of the plates that is rather coarse, so as to produce a granular appearance; there are no separate granules.

No information on the sexual character of this species, whether viviparous or not, or hermaphrodite or not, can be gathered from the single young specimen examined. An interradius was opened, but showed nothing of the genital organs, which had evidently not yet developed.

Ophiomusium constrictum, n.sp.

St. WS 871. 1. iv. 32. 53° 16′ S, 64° 12′ W, 336–341 m. 2 specimens.

Diameter of disk 5 mm. Arms about three times that length, apparently not very stiff. Disk slightly elevated, covered with rather coarse scales, among which the primary plates are not very conspicuous. Radial shields separated by a wedge of scales, somewhat sunken below the level of the surrounding scales. The disk scales are flat, but of a rather coarse structure, as if finely granulated, this granular appearance being more distinct on the radial shields. There is only a single column of fairly large scales in the interradii. The ventral interradii covered with few, rather large, irregular scales. The buccal shields irregular, with the proximal point separated off as a distinct little plate.

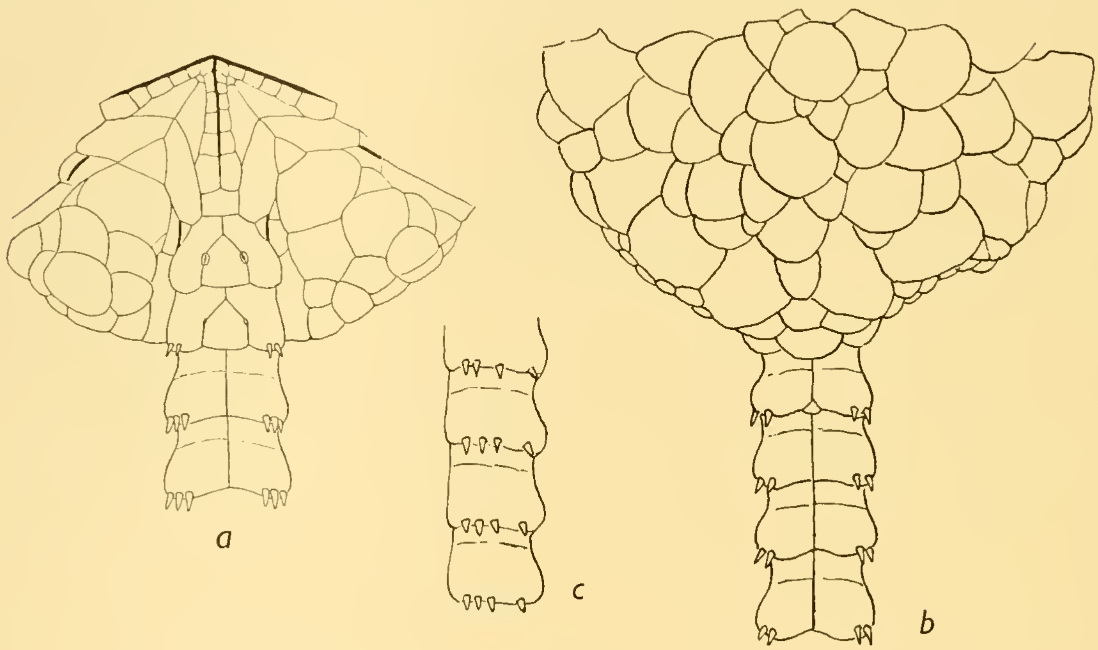


Fig. 52. *Ophiomusium constrictum*, n.sp. Part of oral side (*a*) and dorsal side (*b*); part of arm in side view (*c*). ×15.

Mouth parts of the usual type. First ventral plate small, rectangular, with the merest indication of a proximal angle. Only the two first ventral arm plates developed, and of the dorsal arm plates at most that of the first arm joint is present and then quite rudimentary. The lateral plates are strongly developed, swollen distally, constricted proximally; this constriction is limited from the swollen part by a rather distinct line and forms a kind of neck, the arms being thus rather distinctly moniliform. There are four rudimentary arm spines, the upper one placed a little apart from the others. Tentacle pores exceedingly poorly developed, only on the first joint are they at all distinct, totally lacking or merely discernible on the second joint. Genital slits very short and narrow, scarcely half the length of the first lateral plate. They are surrounded by some small irregular plates, the one to the adradial side being evidently the distal end of the adoral plate, those to the interradial side of the slit representing the proximal end of the genital scale. Colour of the dried specimens white, the radial shields slightly darker.

This species appears to be the nearest related to *Ophiomusium* (*Ophiomusa*) *ultima*, Hertz (Deutsche Tiefsee-Exped., Ophiuroiden, p. 106, Taf. ix, figs. 1–3), in which the arm joints also have a neck-like constriction. Unfortunately, Hertz' figures of this species are not clear, but the much longer arm joints alone show that this East African species (from off Zanzibar) is quite distinct from the present South American species.

Family OPHIOLEUCIDAE

Ophiopyren regularis, Koehler

(Plate VIII, fig. 1)

Ophiopyren regulare, Koehler, 1901. Result. Voyage 'Belgica'. Echinides et Ophiures, p. 26, pl. viii, figs. 52–4.

O. regularis, Koehler, 1922. Austral. Antarct. Exped. Echinod. Ophiuroidea, p. 36, pl. lxxxvi, figs. 1–2.

St. 159. 21. i. 27. 53° 52′ S, 36° 08′ W, South Georgia, 160 m. 1 specimen.

The single specimen of this species taken by the 'Discovery' has a diameter of disk of 8 mm., being thus the largest of the few (in all seven) specimens known. The arms are all broken close to the disk, excepting one, of which a piece 8 mm. in length is preserved.

A conspicuous feature not mentioned by Koehler is that the underside of the disk is a little concave, looking, indeed, like a large sucking disk. Evidently this means that the species lives attached to the surface of stones, corals and the like, such as is the case with *Ophiophycis gracilis*, Mortensen (Echinoderms of St Helena, p. 458), and *Astrophiura* (Mortensen, Echinoderms of South Africa, p. 396). The strong development of the tube feet is also in accordance with the suggestion that it lives thus attached.

The specimen having one of its interradii broken to pieces, I could examine the gonads. They proved to be purely male in character; thus it is certain that the species has separate sexes—which makes it probable, but does not necessarily imply, that it is not viviparous (cf. *Ophiozonella falklandica*).

As appears from the figure given here, the specimen differs in some degree from the description and figures given by Koehler. The buccal shields are slightly different, but more so are the ventral plates; in particular, I do not see these plates divided by a transverse line, as shown in Koehler's drawing (*op. cit.*, 1901, pl. viii, fig. 53). However, owing to the faint calcification of the plates in this species (and in the Ophioleucids in general) the outlines of the plates are difficult to make out. The tentacle scales also are rather differently represented in Koehler's and in my drawings; this would, however, seem to be due to some inaccuracy on Koehler's part, the photographic figure given in his work of 1922 agreeing much better with the figure given here than with his figure in the Belgica Ophiurids. The scales at the proximal pores may be rather difficult to distinguish; they are sometimes hardly more than a raised edge, which is particularly the case on the adradial side of the first pore pair. The spines are of unequal length, the upper much shorter than the lower one. The granules along the edge of the disk do not

form a regular border, as is shown by Koehler (also in the photographic figure). The dorsal side of the disk has evidently been almost completely covered by the granules, only the central plate and a small part of the radial shields remaining bare. Finally the dorsal arm-plates show a characteristic feature not observed by Koehler, the proximal four or five plates having a series of granules along their distal edge (Fig. 53 *b*). I have not observed transverse lines as shown in Koehler's fig. 52.

In spite of the differences here pointed out, I think the present specimen really identical with Koehler's *Ophiopyren regulare*. With the very scarce material available

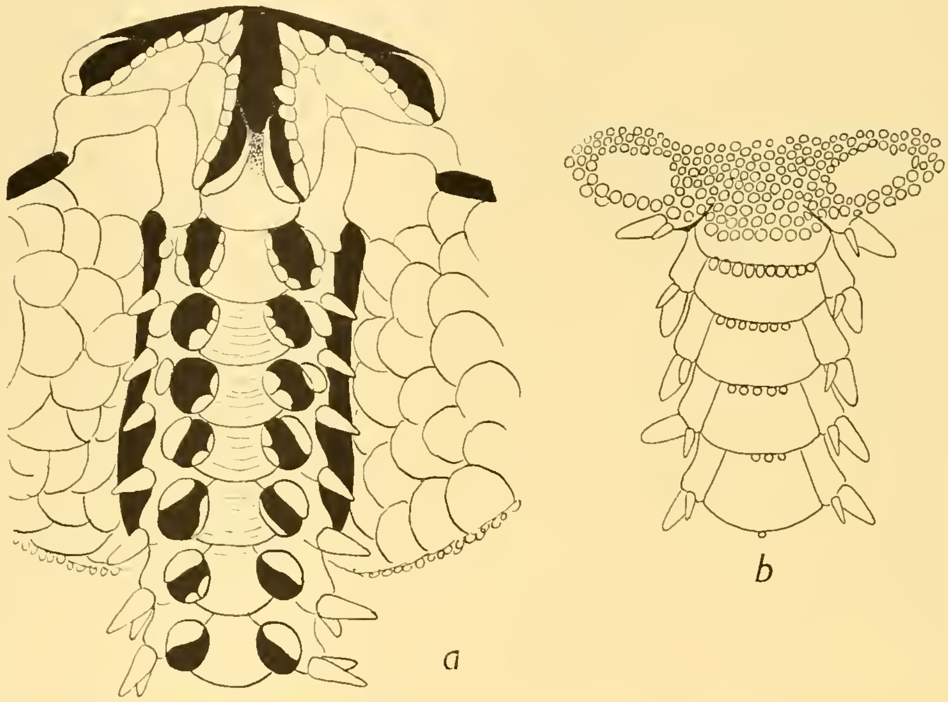


Fig. 53. *Ophiopyren regulare,* Koehler. Part of oral side (*a*) and dorsal side (*b*). ×20.

it would be unreasonable to lay much weight upon the various minor differences, which are due partly to inaccurate drawing, partly no doubt to individual differences, such as are known to occur to no small extent in these feebly calcified deep-sea forms. It would also be rather strange if two different species of these rare deep-sea forms should occur here in the same region.

Plate VIII, fig. 1, is a photograph of the living specimen. The colour is stated to have been "disc deep crimson red with a very large pale pentagonal patch in centre. Arms crimson red barred with cream colour." The preserved specimen does not show the slightest trace of this beautiful colour.

INDEX

Synonyms in italics

PLATE I

Fig. 1. *Austrocidaris canaliculata* (A. Agassiz). Adult specimen, carrying young ones on the apical system, among the spines.

Figs. 2–12. *Ctenocidaris speciosa*, Mortensen.

2. Specimen infested with *Echinophyces*; the spines carrying a number of the bivalve *Limopsis* sp. Half side view.

3. Adult normal specimen, with smooth, spade-shaped oral primaries. Oral side.

4. Young normal specimen, side view. Some *Limopsis* on the spines.

5. Adult normal specimen, with the spines overgrown by *Alcyonidium*. Oral side.

6. Denuded test of normal specimen, side view.

7. Same of a specimen infested with *Echinophyces*.

8, 9. Specimens infested with *Echinophyces*, side view (8) and aboral side (9).

10–12. Denuded tests of specimens infested with *Echinophyces*, showing abnormal position of genital pores, at the edge of the peristome in the female (10, 12), in the middle of the interambulacrum in the male (11).

Figs. 13–15. *Eucidaris tribuloides* (Lamarck).

13. Denuded test, oral side, of a young specimen from the West Indies.

14. Specimen from Ascension, aboral side.

15. Specimen from Ascension, half denuded. Oral side.

All figures natural size.

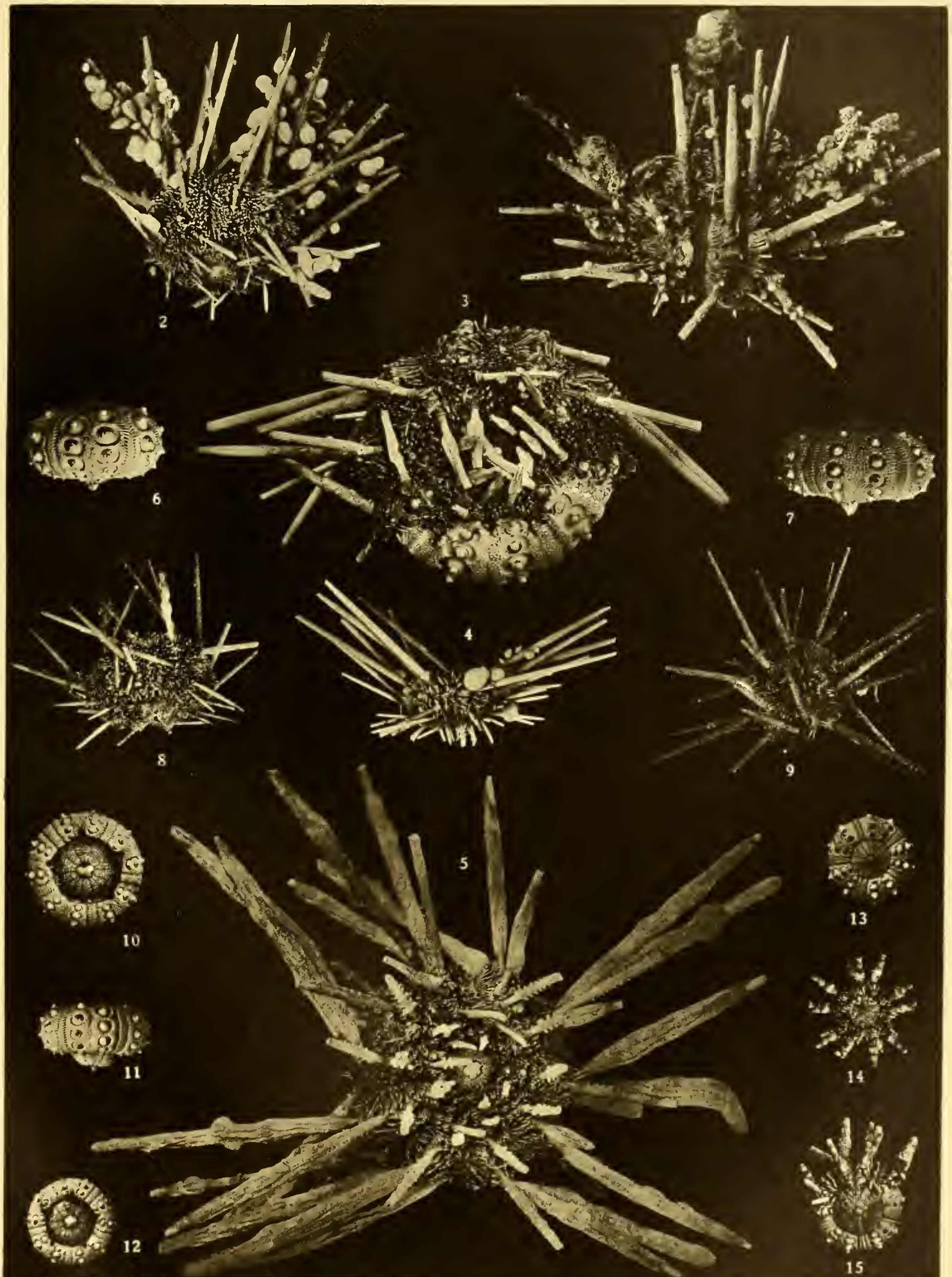


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PLATE II

Figs. 1–4. *Sterechinus Neumayeri* (Meissner).

1–3. Specimens of long-spined form, oral side (1, 3) and aboral side (2).

4. Large specimen, oral side.

Figs. 5–10. *Notechinus marionis*, n.sp.

5, 6. Adult specimens, oral side (5) and aboral side (6).

7–10. Denuded tests, aboral side (7), oral side (8); side view (9, 10).

Figs. 11–16. *Sterechinus Agassizii*, Mortensen.

11. Young specimen, oral side.

12, 13. Well preserved specimens, showing the dense coat of very slender spines. Aboral side (12) and oral side (13).

14–16. Denuded test of very large specimen; side view (14), aboral side (15) and oral side (16).

All figures natural size.

N.B. Figure 5 has become blurred in the reproduction, the spines looking as if they were serrate. In reality they are quite smooth, as in Fig. 11.

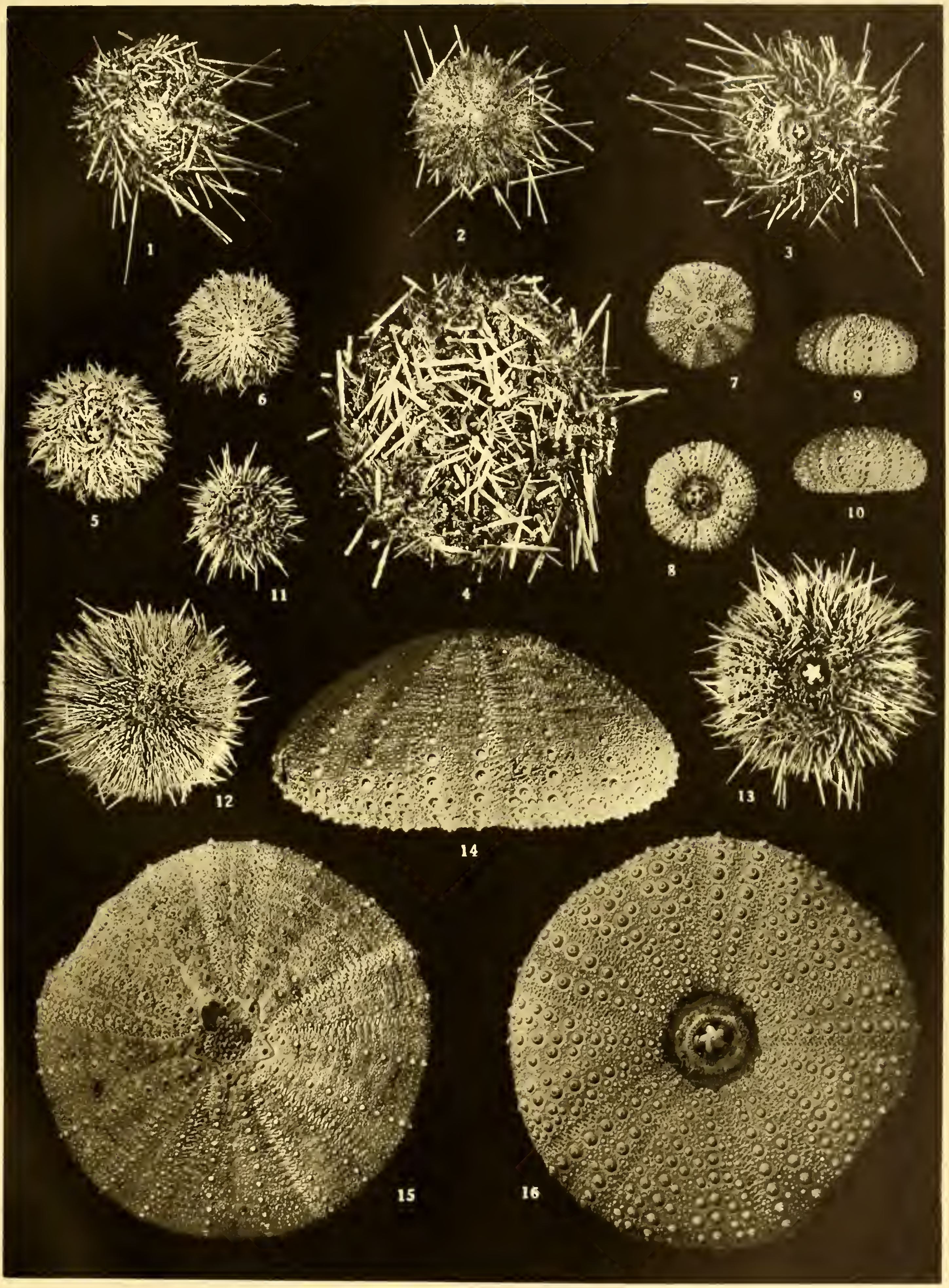

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PLATE III

Figs. 1–4. *Parapneustes cordatus*, Koehler.

1, 3. Male specimen, aboral side (1) and oral side (3).

2, 4. Female specimen, aboral side (2) and oral side (4).

Figs. 5–8. *Amphipneustes Lorioli*, Koehler.

5. Female specimen, denuded; aboral side.

6. Large female specimen, denuded; side view.

7, 8. Male specimen, half denuded; aboral side (7) and side view (8).

Fig. 9. *Abatus curvidens*, n.sp. Type specimen; female, aboral side.

Fig. 10. *Abatus cavernosus*, var. *bidens*, Mortensen. Aboral side.

Figs. 11, 12. *Abatus cavernosus* (Philippi). Inside of test of male (11) and female specimen (12).

All figures natural size.

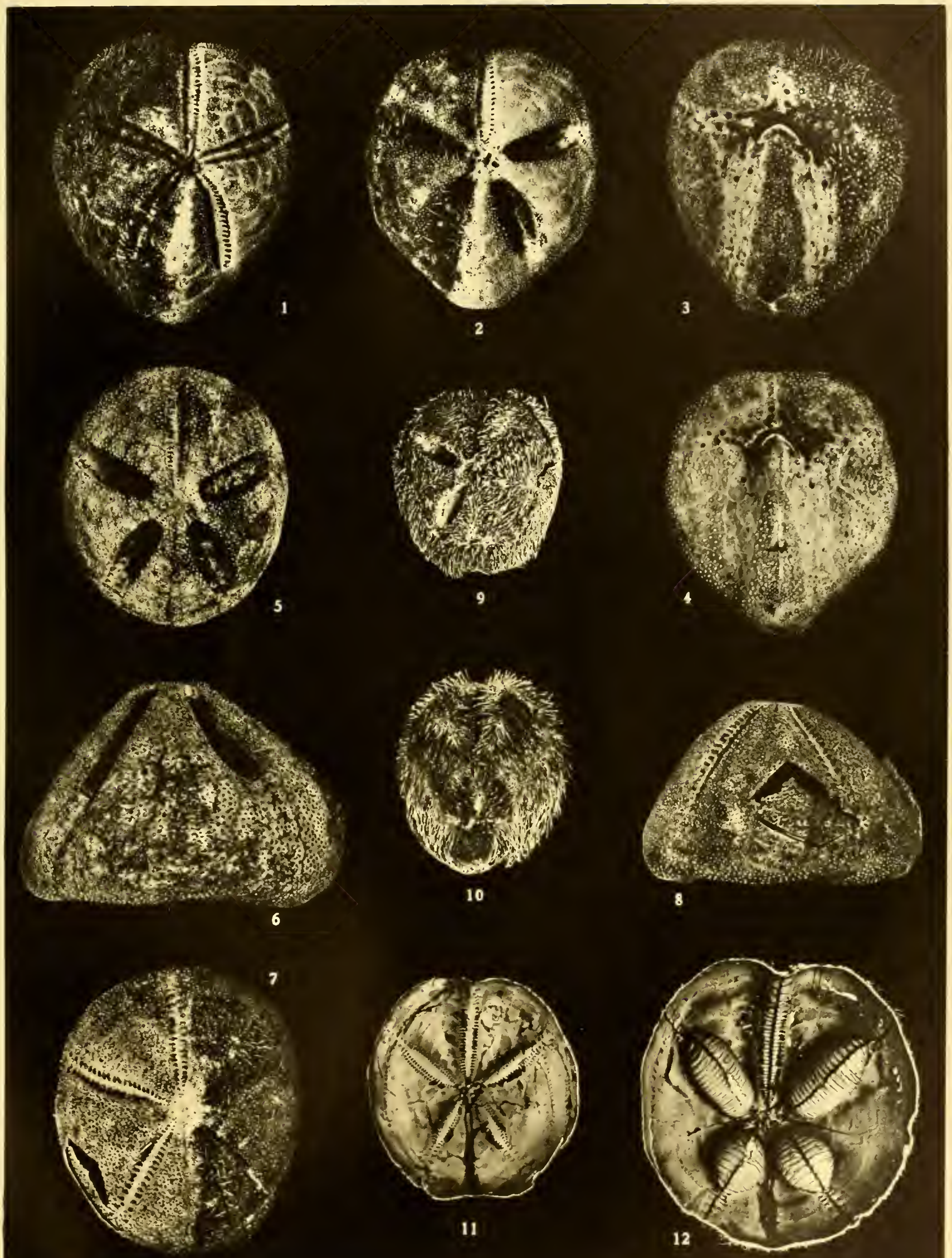

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PLATE IV

Figs. 1–7. *Amphipneustes similis*, n.sp.

1, 2. Female specimen, oral side (1) and aboral side (2).

3. Female specimen, aboral side (Station 170); slightly abnormal, the right anterior petal being undeveloped.

4. Male specimen, aboral side.

5. Female specimen (St. 180), aboral side.

6. Male specimen, side view.

7. Female specimen, side view.

Fig. 8. *Amphipneustes Lorioli*, Koehler. Aboral side.

Figs. 9, 10. *Echinocardium connectens*, Mortensen (?). Aboral side (9); side view (10).

All figures natural size.

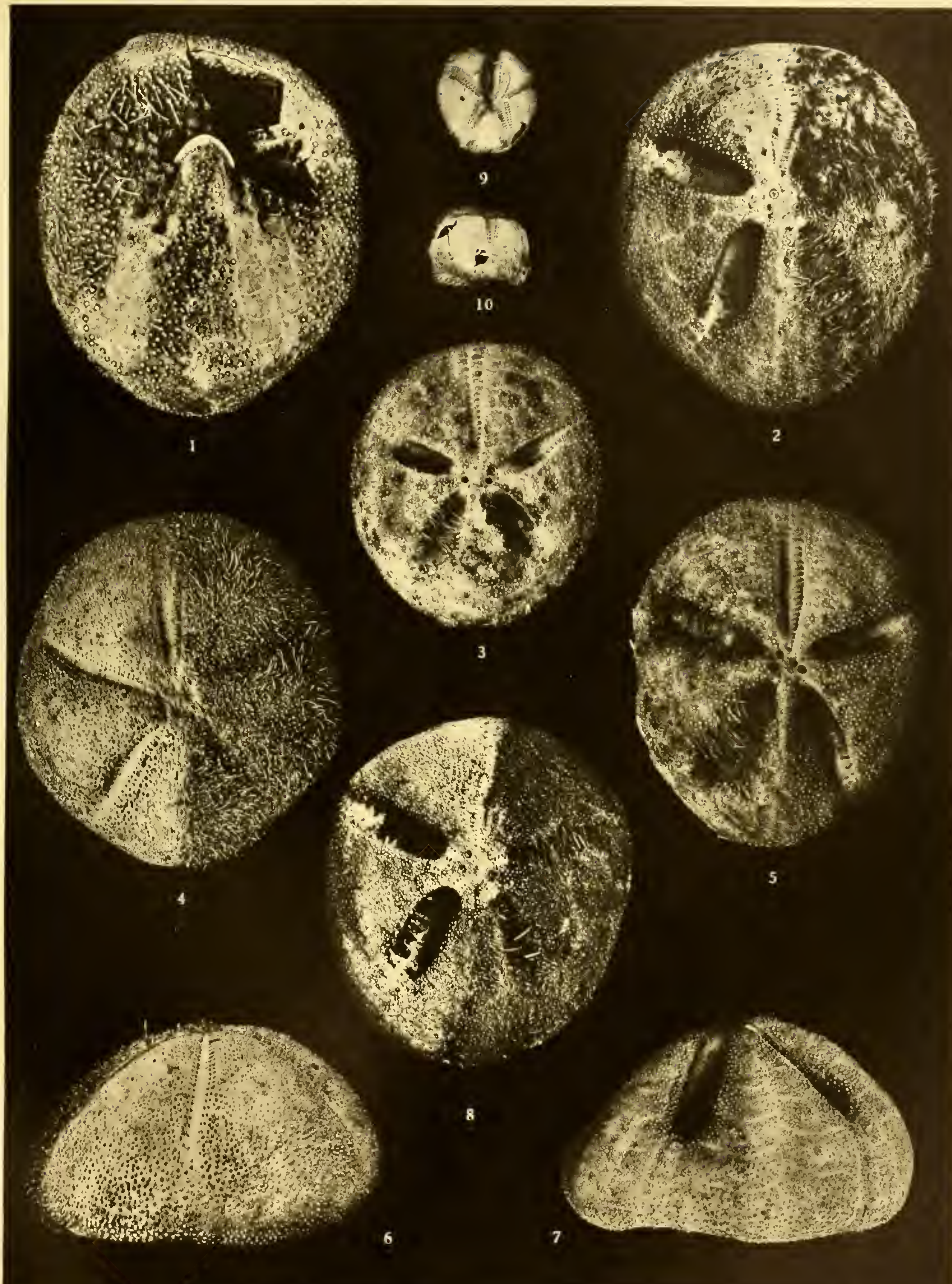

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PLATE V

Figs. 1, 2. *Astrotoma Agassizii*, Lyman. Adult specimens, aboral side. Natural size.

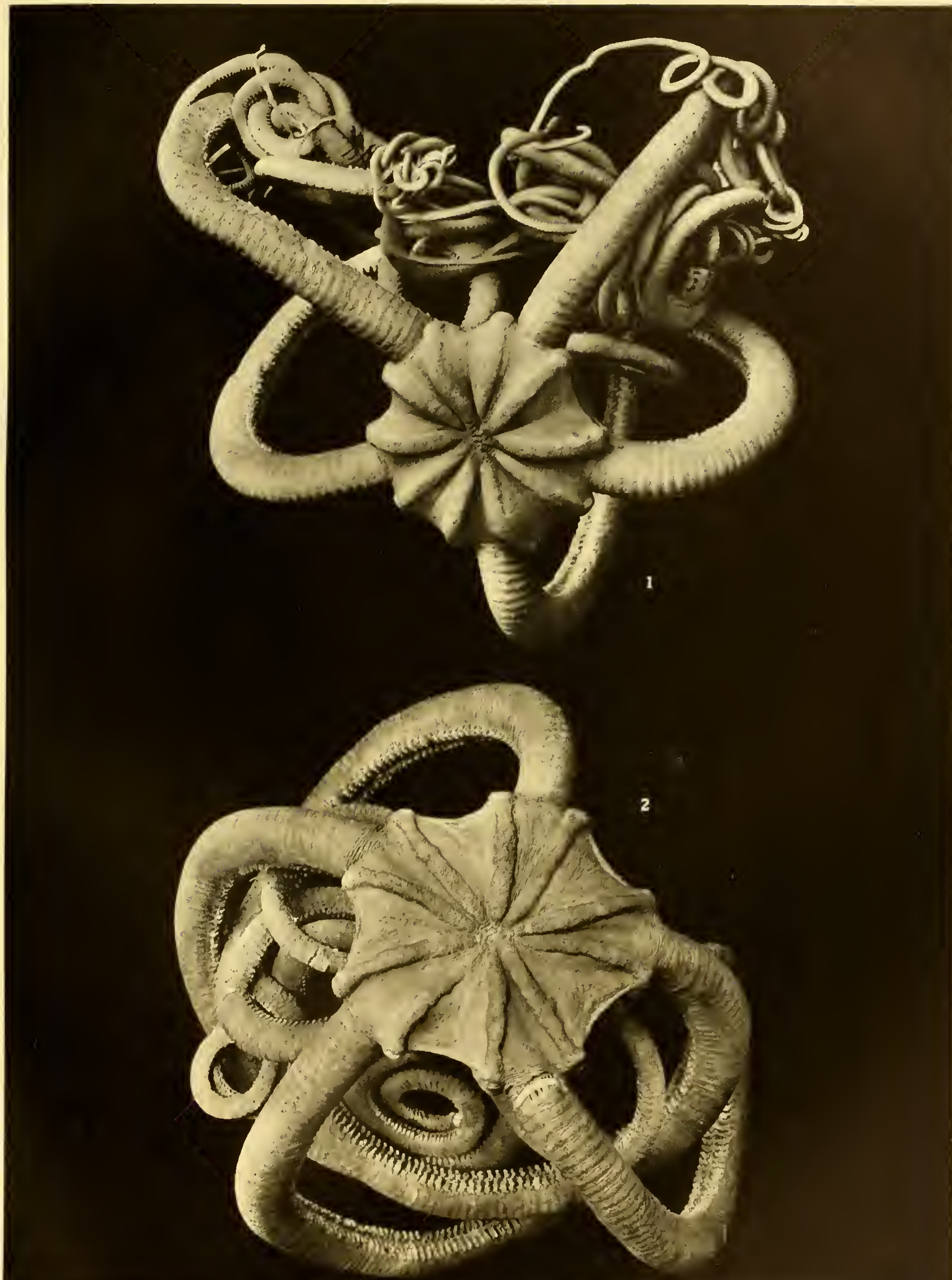

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PLATE VI

Figs. 1, 2. *Astrotoma Agassizii*, Lyman. Adult specimens, oral side. Natural size.

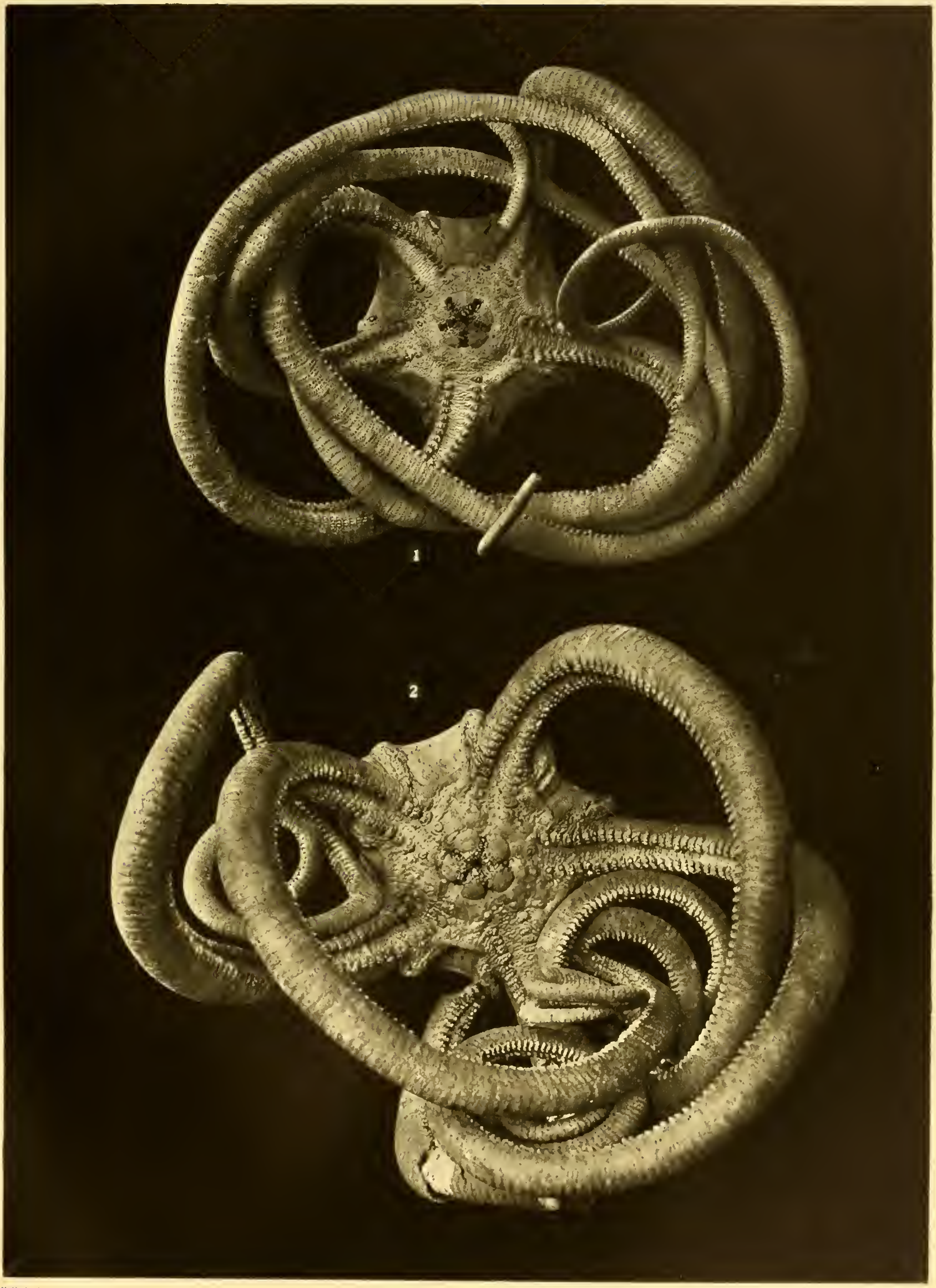

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PLATE VII

Fig. 1. *Ophiacantha densispina*, n.sp. Type specimen. Aboral side.

Fig. 2. *Ophiacantha vivipara*, Ljungman. Specimen carrying young ones.

Figs. 3, 4. *Ophiacantha vivipara*, var. *pentactis*, n.var. Aboral side.

Fig. 5. *Ophiomitrella falklandica*, n.sp. Aboral side.

Fig. 6. *Ophioscolex* (*Ophiolycus*) *nutrix*, n.sp. Aboral side.

Fig. 7. *Ophioceres incipiens*, Koehler. Abnormal specimen; oral side.

Fig. 8. *Astrochlamys bruneus*, Koehler. Specimens in copulation.

Fig. 9. *Astrochlamys sol*, n.sp. Type specimen. Aboral side. Attached to a colony of Bryozoans.

Fig. 10. *Amphiura princeps*, Koehler. Aboral side.

Fig. 11. *Amphiodia ascia*, n.sp. Aboral side.

Figs. 12–15. *Amphioplus peregrinator*, Koehler. Aboral side (12, 14, 15) and oral side (13).

All figures natural size.

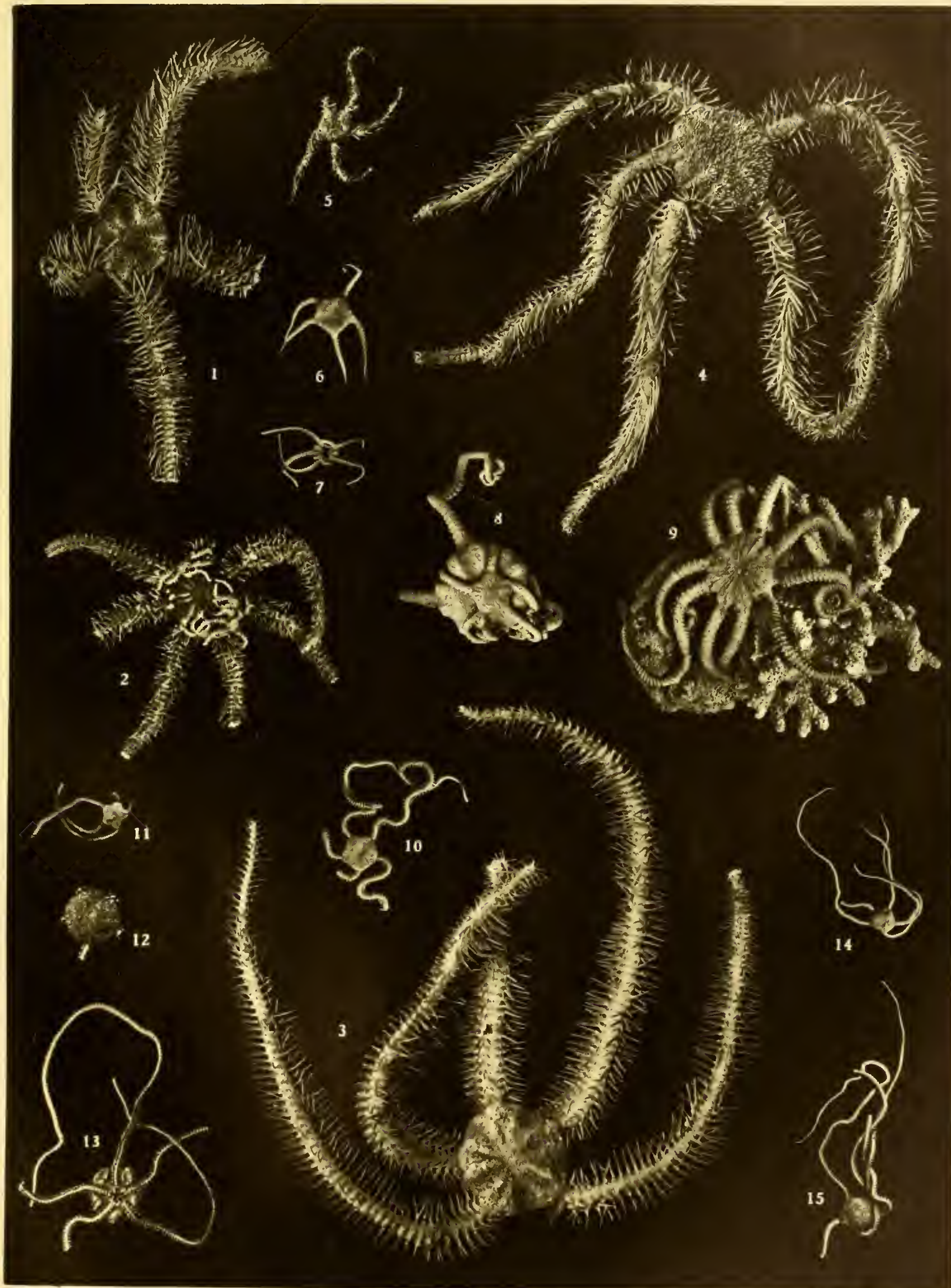

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PLATE VIII

Fig. 1. *Ophiopyren regularis*, Koehler. Aboral side. Photo from life.

Fig. 2. *Ophiocten amitinum*, Lyman. Aboral side. Photo from life.

Fig. 3. *Ophiuroglypha Lymani* (Ljungman). Aboral side. Photo from life.

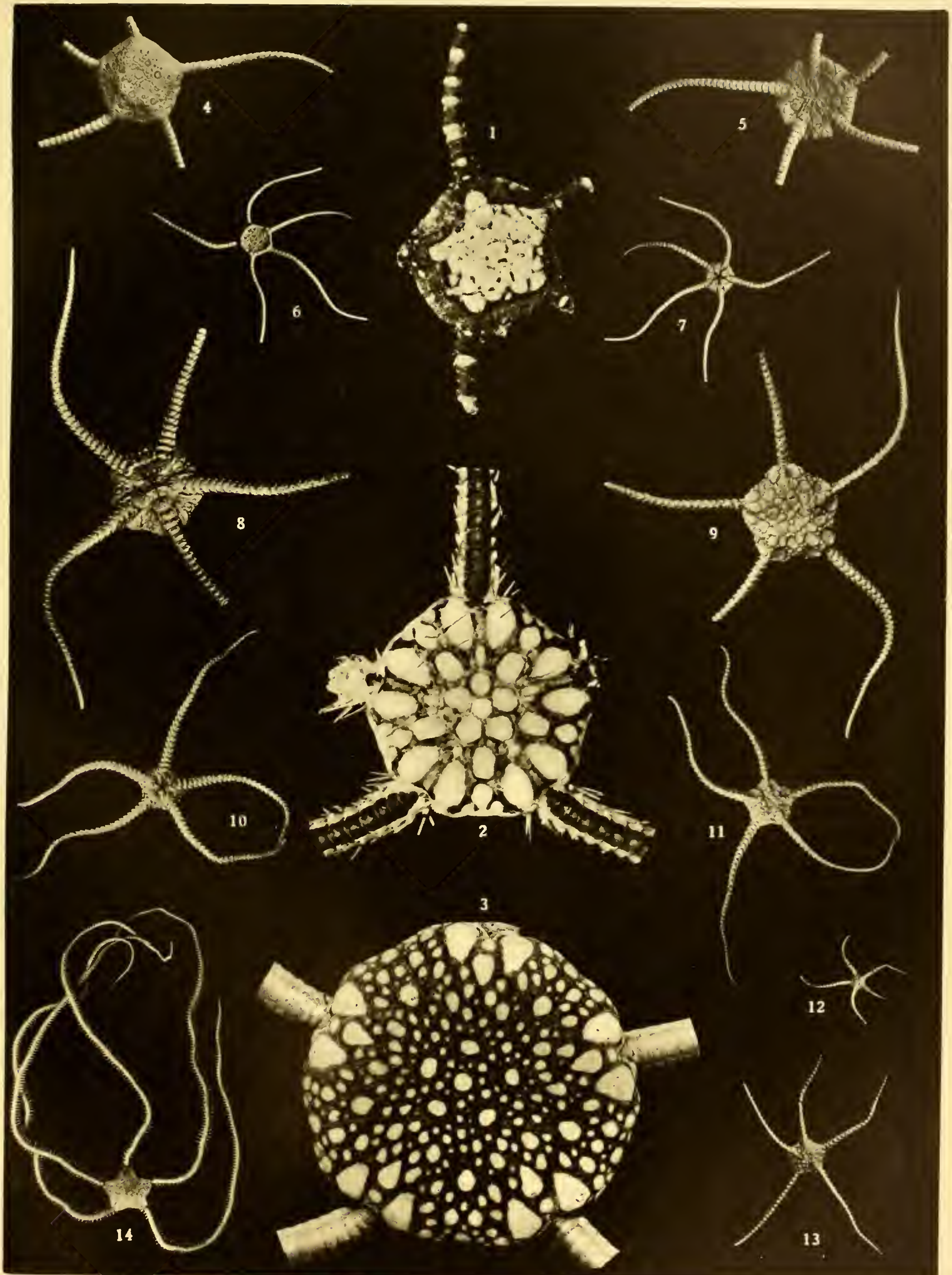
Figs. 4, 5. *Homalophiura inornata* (Lyman). Aboral side (4) and oral side (5).

Figs. 6, 7. *Ophiura Rouchi* (Koehler). Aboral side (6) and oral side (7).

Figs. 8–13. *Ophiurolepis brevirima*, n.sp., specimens of various sizes; oral side (8, 10), aboral side (9, 11–13).

Fig. 14. *Amphioplus acutus*, n.sp. Aboral side.

Figs. 1–3 enlarged; Figs. 4–14 natural size.



Figs 1-3, E. H Marshall phot
Figs 4-13. V Huth. phot.

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PLATE IX

Figs. 1–4. *Notechinus marionis*, n.sp.

1. Tridentate pedicellaria. × 100.

2, 3. Valves of globiferous pedicellariae, small (2) and large form (3). 2, × 200; 3, × 100.

4. Valve of triphyllous pedicellaria. × 200.

Figs. 5–7. *Plexechinus Nordenskjöldi*, Mortensen. Valves of tridentate pedicellariae. × 100.

Fig. 8. *Ctenocidaris Geliberti* (Koehler). Valve of large globiferous pedicellaria. × 72.

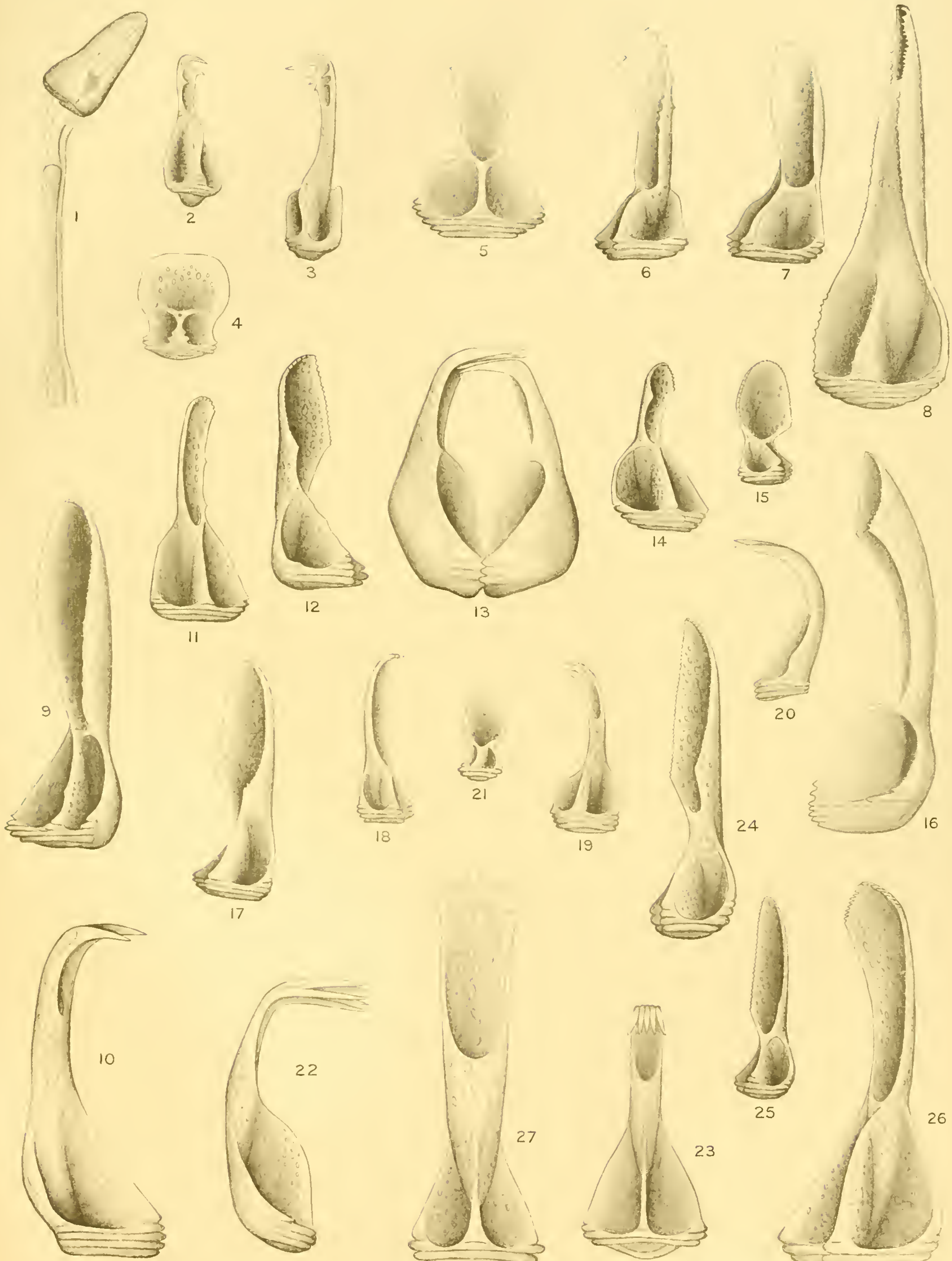
Figs. 9–11. *Abatus cavernosus*, var. *bidens*, Mortensen. Valves of tridentate (9), globiferous (10), and rostrate pedicellariae (11). × 100.

Figs. 12–16. *Abatus elongatus* (Koehler). Valves of tridentate (12), globiferous (two valves in connection) (13), rostrate (14), triphyllous (15), and large tridentate pedicellariae (16). × 100.

Figs. 17–20. *Abatus curvidens*, n.sp. Valves of tridentate (17), rostrate (18), and globiferous pedicellariae (19–20). × 100.

Figs. 21–26. *Amphipneustes similis*, n.sp. Valves of triphyllous (21), globiferous (side view, 22; from the inside, 23), tridentate (24, 25), and rostrate pedicellariae (26). × 100.

Fig. 27. *Amphipneustes Lorioli*, Koehler. Valve of globiferous pedicellaria. × 100.



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[*Discovery Reports. Vol. XII, pp.* 349–376, *Plates X–XII, February*, 1936.]

THE BIRDS OF THE SOUTH ORKNEY ISLANDS

By

R. A. B. ARDLEY, R.N.R.

CONTENTS

THE BIRDS OF THE SOUTH ORKNEY ISLANDS

By R. A. B. Ardley, R.N.R.

(Plates X–XII; text-fig. 1)

INTRODUCTION

THE following notes on the birds of the South Orkneys comprise a complete list of all the birds which visit the group for breeding purposes, or which occur as occasional stragglers. A few species of petrel, notably several of the albatrosses, in their ocean wanderings approach quite near to the islands when they are clear of pack-ice, but it is doubtful if they ever come within about ten miles of them. These wanderers of the adjacent seas have not therefore been included.

The notes are compiled from observations made during the month of January 1933, when the R.R.S. 'Discovery II' was engaged in a hydrographic survey of the islands,[1] and during a few days in February 1931, when the ship revisited Coronation Island.

There are no truly resident birds in the South Orkneys, for the breeding species all leave the islands in the winter and either become pelagic or move to less rigorous regions. However, occasional individuals of most of the species visit the islands from time to time during the winter. All of the birds are oceanic, with the possible exception of the Sheathbill, and none of them are peculiar to the South Orkneys.

In the summer, the bird life is extremely rich, and sixteen species were found to breed in the islands, with two others regarded as possible breeders. These are *Eudyptes chrysolophus* and *Halobaena caerulea*.

An excellent account of the birds of the South Orkneys observed during the Scottish National Antarctic Expedition is given by Mr Eagle Clarke in the *Ibis* for January 1906. The observations of this expedition, however, were almost entirely confined to Laurie Island and the neighbouring islets; the present notes include the whole group. It has not been found necessary in most cases to enlarge on the descriptions of the plumage of such species as are included in the Scotia report, or are already well known.

A matter for regret is that hardly any material was brought back from the South Orkneys. This was due partly to the writer's inexperience in skinning and partly to pressure of work, for in only twenty-eight days the entire group was surveyed and the ship's company was kept fully occupied. Eggs of most of the breeding birds were obtained. The breeding-places of sixteen species are shown in Fig. 1.

My thanks are due to Mr N. B. Kinnear for his assistance and interest, to Mr A. G. Bennett, and to Mr Bruhns of the Argentine Meteorological Station in Scotia Bay for information regarding the bird life there.

[1] See J. W. S. Marr, *The South Orkney Islands*, Discovery Reports x, pp. 283–382, pls. XII–XXV.

SYSTEMATIC ACCOUNT

Aptenodytes forsteri, G. R. Gray, Emperor Penguin.

The Emperor Penguin occurs at the South Orkneys only as an occasional winter straggler. According to Mr Bruhns, the official in charge of the Argentine Meteorological Station in Scotia Bay, one or two birds are seen during the course of nearly every winter. From his description these are mainly adults. They only occur when the islands are closely surrounded with pack-ice and are evidently non-breeding birds. In the summer, the bird has apparently not recently been seen at the station, though the islands are often beset with ice for periods during the summer.

The Scotia Expedition have a record of a bird, probably belonging to this species, which was seen in Scotia Bay in November 1903, and two were seen in March 1905 (Eagle Clarke, 1906).

Emperor Penguins are comparatively common in the ice of the Weddell Sea, and it is probable that there is a fairly extensive breeding ground somewhere within its area. The birds which occur at the South Orkneys are certainly from the Weddell Sea, and travel up on the great ice drift from its western side. In January 1932, several adult birds were seen in pack-ice about 250 miles east-south-east from the Orkneys, but in 1933, when the 'Discovery II' visited the group, there was no pack-ice in the vicinity. Since the Emperor Penguin is essentially a bird of the pack-ice, it would never be seen in the South Orkneys when open sea surrounds them.

Pygoscelis adeliae (Hombr. et Jacq.), Adélie Penguin. (Plate XI, fig. 1.)

Adélie Penguins are extremely numerous in the South Orkneys, and a rough census taken of all the rookeries in the group resulted in a total of about 1,500,000 nests. This gives a population of about three million. The Scotia Expedition estimated the number at five million (Eagle Clarke, 1906), but it is difficult to estimate the number with any degree of accuracy. There was no evidence either of increase or decrease in the number of nests in the rookeries, and the inference is that the penguin population maintains a fairly even level. At a rough estimate, perhaps half the chicks hatched (about 1,500,000 birds), take the water for the first time each year. Apparently little is known of the normal span of life of penguins, but the mortality rate, even among adults, must be high. Probably in the winter months, as well as in the breeding season, many fall victims to sea-leopards, killer whales, and natural catastrophes. It is doubtful if many perish from starvation, for there is always food in plenty, and the only circumstance which would be likely to involve risk of starvation would be for parties of birds to be stranded on unbroken fields of consolidated pack. This, in the Weddell Sea area where the ice is always moving, would be of rare occurrence.

Laurie Island is the chief breeding-place for the birds, and huge rookeries are established on every suitable site. On Weddell and Saddle Islands the majority of birds are *P. antarctica*, for here the sites are generally steeper. On Powell Island there are large rookeries, but on Coronation and Signy Islands there are only five comparatively small rookeries in all, none of which are to the west of Signy Island. Thus in the South

Orkneys we see the same curious distribution which was observed in the South Shetlands, *P. adeliae* preponderating in the eastern half of the group, and *P. antarctica* in the western half.

The birds come ashore in early October, and egg-laying begins in the last few days

Fig. 1. Chart of the South Orkney Islands showing the positions of breeding-places, which are indicated by letters under the place names. Small letters indicate that breeding birds are present, and capitals that large numbers of birds (5000 or more) nest in the localities.

A, a. Pygoscelis adeliae.
B, b. Pygoscelis antarctica.
C, c. Pygoscelis papua.
D, d. Macronectes giganteus.
E, e. Daption capensis.
f. Pagodroma nivea.
G. Priocella antarctica.
H. Pachyptila desolata banksi.
I, i. Oceanites oceanicus.
k. Fregetta tropica melanogaster.
l. Catharacta skua lönnbergi.
m. Larus dominicanus.
n. Sterna hirundinacea.
o. Sterna vittata georgiae.
p. Phalacrocorax atriceps.
r. Chionis alba.

of the month. The staff at the Argentine Meteorological Station stated that every year the date of the first eggs is nearly the same, and that there are always hundreds of eggs to be gathered in the first three days of November.

The young are hatched during the first few days of December; but we did not arrive at the islands until January 1, so that the early life of the chicks was not observed.

From January 1 to 21, various rookeries were almost continuously under observation, and the habits of the birds closely conformed with the excellent account given by Dr E. A. Wilson in the report of the National Antarctic Expedition (1901–3). A point which continually struck the observer, and is remarked in nearly all previous reports,

was the progressive state of filth, confusion, and smell in the rookeries. In the early days of January the colonies were still comparatively orderly, individual nests were well marked, and the chicks, still fairly small, seemed to be more under the control of the parent birds, who were well able to protect them from the depredations of the many skuas which frequent the rookeries. The young birds grew at an astonishing rate, and by January 5, the "crèche" system, whereby parties of from ten to twenty chicks are herded together under the supervision of a few old birds, was beginning to become necessary. The rookeries henceforward lost all semblance of order, becoming progressively filthier and more untidy. The nests were scattered and trampled out, and as the chicks grew larger and individuals wandered from the flocks, the death-rate mounted. Every day more dismembered remains and flattened, trampled corpses of youngsters which had fallen in the race were to be seen. The skuas had growing and ravenous young of their own to feed, and were increasingly vigilant and bold in their attentions. Giant petrels and sheathbills were always in evidence about the rookeries. These birds were never seen to attack a strong and healthy chick; always they waited until an ailing youngster was almost at the point of death. It is safe to say that no weakly penguin chick has the smallest chance of surviving in an Adélie rookery. If it were lucky enough to escape its natural enemies, it would soon starve from being unable to pester and attract the attention of an old bird and induce it to provide food, or would be trampled beneath the heedless feet of its stronger contemporaries.

By January 13 the chicks in the large rookery surrounding Ellefsen Harbour in Powell Island were beginning to lose their nestling down. These were reckoned to be from $5\frac{1}{2}$ to $6\frac{1}{2}$ weeks old. The chicks at this time assisted one another to pluck the down, with the occasional attention of an old bird, which was given in an absent-minded manner. After January 21 the birds were not watched ashore in the rookeries, but by that date most of the young birds were in their normal first-year plumage, though none were seen to enter the water.

In all the nests examined during the early days of January, two chicks were found. No eggs were seen, and addled eggs appear to be a rarity. In this respect *P. adeliae* differs from some other penguins. Many bones were seen in the nests and the nesting birds probably collect the skeletons of the previous year's dead to add to their usual pile of stones.

Adélie Penguins in their choice of nesting sites undoubtedly prefer low, rocky shores, and they were never found on steep rocky slopes and scarps in such positions as might be occupied by Ringed Penguins. With a little practice it is easy to distinguish from seaward the species inhabiting a rookery, even when individual birds cannot be identified. Adélie rookeries have a brick-red appearance, while rookeries of Ringed Penguins are paler and yellowish in colour. This colouring is due to the profusion of excrement about the rookeries, and the difference must result from some small divergence in the general diet of the two species. Another good indication in identification is the character of the site, for a rookery established in a steep and difficult situation is almost certain to contain Ringed Penguins.

The two species are never found to intermingle in the rookeries, though colonies may be established adjoining one another. The Gentoo Penguin, however, establishes his small settlements among rookeries of *P. adeliae*, and the two species live in close company on amicable terms.

The Adélie Penguins leave the South Orkneys in the early part of April, and probably spend the winter in a pelagic state, moving about among the ice until the following spring, when they again seek their breeding haunts. During the winter a few birds are nearly always present in Scotia Bay, and no doubt parties of birds come ashore to rest, at times, on every landing place in the group.

While the 'Discovery II' was engaged in survey work round the islands several fine opportunities for observing the birds swimming occurred. As the ship cruised slowly along the shores, companies of swimming penguins would often remain close alongside for considerable periods. From the flying bridge, in calm weather when the sea was smooth, their method of swimming was well observed. As stated by Dr E. A. Wilson the flippers alone are used for propellent purposes. The flippers are brought forward to a position almost at right angles to the body, edged horizontally. For the backward stroke, the anterior edges of the flippers are depressed, so that the flippers make an angle of about 30° with the horizontal. They are then swept backward and slightly downward, until they lie at an angle of about 45° with the line of the body with their tips slightly depressed. A momentary pause in the stroke is noticeable here, then the flippers are edged horizontally and swept to the front again for the next stroke. When the birds swim rapidly the pause is so brief as to be hardly noticeable, and the flippers move so fast that it is impossible to follow them, but the same process is evidently carried out. This method of swimming appears to give the birds a gently undulating motion in their progress under water. When they break surface for breathing, or "porpoise", the last down-stroke before surfacing is apparently a strong one, and the head and tail appear to be both raised until the bird comes to the surface, when they are both immediately depressed. Sharp turns are carried out, apparently, with a combined movement of flippers, tail, and feet, the latter acting as a rudder, and for ordinary small alterations of course the tail alone is sufficient for steering. When swimming, penguins carry their feet held out in line with the body, the webs partially folded in so that the claws are nearly closed up on each other. Adélie Penguins often swim on the surface, more frequently when near their rookeries or during rests from feeding. When alarmed they can attain a good speed in the water, and can certainly move at from 10 to 12 m.p.h., at any rate for short distances.

Dr Wilson has written such an excellent account of these engaging birds that little more remains to be said concerning their habits.

Pygoscelis antarctica (Forster), Ringed Penguin. (Plate X.)

In the South Orkneys, Ringed Penguins breed in large numbers on all the islands, and this group ranks with the South Shetlands and South Sandwich Islands as one of the three main breeding grounds of the species. A rough census taken of the group in

January 1933 gave a total of about 1,500,000 nests, the birds being about equal in point of numbers with *P. adeliae.*

Although *P. adeliae* are in the vast majority on Laurie Island, there are several large rookeries of *P. antarctica*, notably on Cape Robertson and on Ailsa Craig. Saddle, Weddell, and Bruce Islands give nesting sites to large numbers of the birds, and there are several small rookeries on Powell and Fredriksen Islands and the adjacent rocks and islets. Coronation Island, however, is the main stronghold of the species. All along the coasts, wherever rocky outcrops break through the usual ice-cliffs, small colonies of the birds are established, and in Sandefjord Bay and the south-west corner of Coronation Island there are huge rookeries containing at least 200,000 nests. Another large rookery is established on the Robertson Islands, and there are straggling colonies on the Inaccessible Islands.

The Ringed Penguin is often found to choose nesting sites in very much steeper and more difficult places than is usual with any other penguin. Sometimes the rookeries are even difficult of access to man, and the toil to which the birds are put in landing on the steep-to shores and climbing to their nests is often enormous (Plate X, fig. 2).

On Fredriksen Island, and in some parts of Sandefjord Bay, birds in steep places were sometimes seen to lose their footing and tumble headlong for considerable distances down the rocks. This experience appeared to harm them not at all. From seaward, some of the small colonies round the coasts appeared to be placed in even steeper and more precarious sites than those which were visited, this being so in particular on the Inaccessible Islands.

The birds breed about three weeks later than *P. adeliae*, the eggs being laid as a rule in the last few days of November. On January 4, 1933, the nests in the rookeries on Powell and Fredriksen Islands contained eggs and newly hatched chicks in almost equal numbers, none of the chicks being more than about four days old. Each nest had two eggs or young, and few deserted eggs were seen. On January 9 the birds in the Sandefjord Bay rookeries had reached the same stage, and by January 11 almost all the eggs had hatched in this locality (Plate X, fig. 1). This retardation in breeding of the birds in the western part of the group may be explained by the circumstance that the Sandefjord Bay rookeries are mainly more exposed and are thus more likely to be snowed over than the Fredriksen and Powell Island rookeries.

On February 15, 1931, the rookeries at Sandefjord Bay were visited, and at this time the young were almost full grown but had not begun to shed their nestling down, though the first plumage was well developed beneath it. Thus they were nearly a month behind the Adélie Penguins in reaching this stage. A few of the fledglings were killed, and their crops contained remains of Euphausians and Amphipods. The hatching and fledging dates in the South Orkneys seem to be about the same for the South Shetlands.

In the rookeries, the Ringed Penguin is very much less tolerant of the presence of sheathbills than is the Adélie Penguin. The latter seems to ignore the sheathbill unless the bird actually disturbs its nest, but it was noticed that Ringed Penguins always chased sheathbills away from their chicks. The two penguins are similar in point of pugnacity,

but the Ringed Penguin is a more persistent and courageous bird, and will, when enraged, return to the attack of an intruder after being repulsed several times, with complete disregard for danger. These two species are the most engaging of all penguins, and to watch their antics when quarrelling, love-making, attending to their young and travelling between their rookeries and the sea, is a source of the greatest diversion.

A practice which is shared exclusively by these two species is that of hauling out on icebergs and detached fragments of ice at sea. Here again the Ringed Penguin will choose most difficult and steep bergs on which to rest, while the Adélie is only seen on low, fairly level-surfaced bergs or flat pieces of sea-ice. Almost anywhere within the range of the Ringed Penguin all accessible bergs are occupied by some of the birds, or bear indications of their visits.

Pygoscelis papua (Forster), Gentoo Penguin. (Plate XII, fig. 3.)

This bird breeds in the South Orkneys, but in very much smaller numbers than either *P. adeliae* or *P. antarctica*. The Scotia Expedition estimated the population of Laurie Island to be 100,000 birds (Eagle Clarke, 1906). In the large Adélie rookery in Ellefsen Harbour, small groups of *P. papua* were found nesting, the total number of nests being about a thousand. Nowhere else in the South Orkneys were rookeries found, and since they apparently only nest in company with *P. adeliae* in this locality it is very improbable that any rookeries are established on Coronation Island. The only birds seen round Coronation Island were in Sandefjord Bay, where on January 10 about thirty birds were seen ashore near a branch of the large Ringed Penguin rookery.

The nests in the Ellefsen Harbour rookeries were under observation for several days in the early part of January. These nests showed good discrimination on the part of the building birds in selection of their sites, for nearly all of them were placed in some kind of shelter, under the lee of large rocks or in clefts in the rocky ground. The nests of the Adélies, in comparison, appeared to have been established in quite a haphazard fashion, without regard to any convenience or natural advantage.

Usually from three to about twenty nests were associated in each group of *P. papua*, and the nearest nests of the Adélies were always several feet distant. The contrast in disposition between the two species is remarkable when the birds are observed simultaneously. The Gentoo is a comparatively quiet and timid bird and when disturbed usually leaves its nest after a few half-hearted attempts at biting. Compared with the Adélie's liveliness and pugnacity, it is a lethargic and stolid bird. The Gentoo also goes to more trouble in the building of its nest, keeps it cleaner and more orderly, and appears to be more solicitous of its chicks. Each pair of parent birds keeps the young in the nest until they are almost ready to fend for themselves.

On January 4, 1933, the chicks in the Ellefsen Harbour colonies were either newly hatched or only a few days old, and several unhatched eggs were found. Each nest contained two eggs or chicks.

In the rookeries in the Palmer Archipelago, farther south, the chicks are not hatched until the middle of January, while in South Georgia they are hatched in early December.

Thus it is evident that the more rigorous the climate the later the hatching date, and this rule applies to nearly all Antarctic birds which have a breeding range embracing considerable differences of latitude.

In April the Gentoos, like the other penguins, leave the South Orkneys and become pelagic, but occasional stragglers are seen from time to time during the winter. The bird is not a creature of the pack-ice, and is very rarely seen on floes. Probably when approaching the islands the birds wait until the ice is either temporarily clear, or sufficiently open for them to make the approach by water.

Eudyptes chrysolophus (Brandt), Macaroni Penguin.

The Scotia Expedition found five single specimens of *E. chrysolophus* among penguin rookeries on Laurie Island, and suspected that the bird probably bred in the South Orkneys (Eagle Clarke, 1906). Bennett (1926, p. 312) states that it breeds in all the Dependencies of the Falkland Islands, but there appears to be no record of any rookeries having been found in the Orkneys.

During the visit of the 'Discovery II' a sharp look-out was kept for the bird all round the group, but no sign of a rookery was found. One adult male was captured in the Ringed Penguin rookery at the south end of Fredriksen Island; this was the only bird seen.

Although in view of the diligent search I think it improbable that this species breeds in the Orkneys, it is possible that a small rookery might be established on one of the off-lying islets between the two largest islands, where it might easily be overlooked. As an instance, there is a small rookery of macaronis established right in the middle of the great *Pygoscelis antarctica* rookery on Deception Island, which has often escaped the observation of people who have visited the Ringed Penguin rookery.

In the Scotia Report, Eagle Clarke points to the probability of a breeding ground in the South Orkneys, since the birds captured were young and could hardly have accomplished the rough sea passage of 600 miles from South Georgia. Since this report was published, however, it has been discovered that there are several rookeries of *Eudyptes chrysolophus* in the South Shetlands. This fact reduces the sea passage to 200 miles, with wind and sea conditions favourable, and it is no longer necessary to assume the existence of a South Orkney rookery. It is unlikely that the bird visits the group during the winter, for it dislikes ice and is never seen when pack-ice is in the vicinity.

Macronectes giganteus (Gmelin), Giant Petrel. (Plate XII, figs. 1, 2.)

The Giant Petrel breeds in considerable numbers on the South Orkneys. On the northern coasts of Laurie Island there are several colonies, and the Scotia Expedition estimated the number of birds at about 5000. On the islets surrounding Ellefsen Harbour there is a large colony containing about 600 nests, but the main stronghold of the species is on Signy Island, where their nests are established all along the western coast. A large colony is also present on the slopes above Borge Bay. The nests are all built on low foothills and gently rising slopes near the sea.

An excellent account of the habits of this species is given by L. H. Matthews (1929), and nothing further remains to be said in that respect.

In the South Orkneys, laying takes place about the middle of November, and on January 4 hatching had just commenced in the colony in Ellefsen Harbour. This gives an incubation period of about seven weeks. On this date about one in four of the nests contained newly hatched chicks and the majority of the remaining eggs were cracking. By January 14 all the eggs were hatched.

The colony at Borge Bay is very straggling, but in their choice of nesting sites the birds are gregarious, and usually from six to twenty nests are associated in groups. On January 17 all the nests here contained chicks. A single parent bird only was usually present at each nest, but sometimes the mate would appear, usually with food for the chick. As usual, when their nests were approached the birds vomited the contents of their stomachs. In the Borge Bay district the contents were found to consist mainly of Euphausians, while in the Ellefsen Harbour colony, which adjoins the Adélie rookery, remains of young penguins, and in one case half a large fish, were among the Euphausians. The plankton probably came from the stomachs of young penguins.

No whalers were working near the South Orkneys in January 1933, and it is probable that the birds found more difficulty than usual in obtaining food. Certainly they kept a very sharp eye on the penguin rookeries, and were ready to attack any dead or ailing chick, advancing upon such an unfortunate at a clumsy waddle, wings half spread and neck outstretched.

With regard to colour phases, it was found that at Ellefsen Harbour the average proportion of white birds was 10 per cent, and at Borge Bay 9·5 per cent. The average of birds seen about the remainder of the islands was also 10 per cent. This agrees well with the observations of Bennett in the South Shetlands a few years ago, where he found an average of 12½ per cent of white birds. The Scotia Expedition, however, found an average of only 2 per cent of white birds in the South Orkneys (Eagle Clarke, 1906). It would be interesting to know if only *absolutely* white birds were included in this count, for in a number of the birds included in the Discovery percentage, a few feathers were very faintly flecked with grey—a common feature in "white" birds. Eagle Clarke also mentions a number of very dark brown birds seen in the Orkneys. On the present visit, *no* dark-phase birds at all were seen anywhere in the group. All were in either the white or intermediate phase (Plate XII, fig. 2), and the observations suggest a progressive lightening of the plumage of the South Orkney birds in the last thirty years.

L. H. Matthews, in his account of the birds of South Georgia (1929), recognizes three main phases in the plumage of the Giant Petrel—dark, light, and intermediate. Bennett refers to four—"all-browns", "grey-necks", "white-necks", and whites. These phases are referred to by Lowe and Kinnear (1930, pp. 151–4). In my opinion, a better nomenclature would be: (i) dark—uniformly dark brown or brown, (ii) dark intermediate—plumage mainly grey-brown, flecked here and there with dirty whitish, grey neck, (iii) light intermediate, generally lighter grey and with more dirty whitish about the plumage than (ii), and with white head and neck, and (iv) white. The gradations of

plumage between the dark form and the white are too varied to be classed all together as intermediate as Matthews has done.

The true plumage in the dark phase is a rich, very dark brown, which appears almost black in some lights. Lowe and Kinnear are of the opinion that "brown" birds are merely faded specimens of the true dark phase and with this I am in entire agreement. A large series of observations was made during the first two voyages of the 'Discovery II', and it was repeatedly noted that very dark birds were always in excellent plumage. "All-brown" birds were always drab brown or greyish brown, with a dingy, faded appearance, and in no case was such a bird in good trim. The plumage was invariably to some degree ragged and often there were feathers missing. Probably dark phase birds only remain in good condition for a few months after the moult, after which fading and weathering take place. The same fading occurs in several brown Southern Ocean birds, notably in the case of *Thalassoica antarctica*. After the moult the brown plumage of these birds is a rich chocolate colour, but later it acquires a drab and faded appearance.

A correlation of colour phases with latitude over the South Atlantic Ocean, at any rate in the oceanic range of the species, is clearly indicated by the observations of the 'Discovery II'. North of about latitude 52° S no white birds were seen, and the great majority were dark. Between this latitude and the Antarctic circle, the percentage of white birds increases progressively with at first dark and then light intermediate forms predominating. In summer it would not be exaggerating to say that every degree of latitude southward from the northerly limit of range of the species shows collectively a progressive lightening in the plumage of the birds. In winter there is likely to be little material alteration, for the latitude range of the birds is merely moved bodily northward some five degrees. Observations in winter over the South Indian and South Pacific Oceans did not give such definite results, although more light-plumaged birds were seen in the southerly part of the range. In the Falklands, dark and intermediate phases are equally numerous, the majority of the latter being dark intermediates.

Of the South Orkney birds 10 per cent were white, about 75 per cent were light intermediates, and the remaining 15 per cent dark intermediates. A considerable number of the light intermediates were very light, being mainly white with light grey-brown specklings.

In view of Eagle Clarke's account, it seems probable that in the South Orkneys a white race is evolving. Mr R. A. Falla is engaged on an account of the birds observed on Sir Douglas Mawson's 1929–30 Expedition, and it will be interesting to note his conclusions with regard to the Giant Petrels of Kerguelen and Heard Island.

An explanation of the increase in white and light intermediate birds in the far south is suggested by the development of southern whaling during the last twenty-five years. Where whaling is in progress food is abundant and easily obtained, and it is probable that this has brought about an increase in the Giant Petrel population of high southern latitudes. Since colour is correlated with latitude the increase will be mainly among white and intermediate birds, with the result that higher percentages of these forms are

now to be seen at the South Orkneys. It seems certain that Giant Petrels are commoner in high south latitudes than they were before whaling commenced.

From observations of the chicks in the South Orkney colonies it is evident that the colour phases are inherited. The percentage of chicks in pure white down was about the same as or a little greater than the percentage of white adults. White chicks were almost always seen in the nests of white adults, and in the remaining nests both parent birds were not seen. In only a few cases were both parent birds seen together; those of one pair were both white, the remainder being either both intermediate or intermediate and white. The chicks of intermediate birds were in very light grey or dirty whitish down (Plate XII, fig. 1). Each occupied nest in all the colonies visited contained one chick, but there were a number of unoccupied nests, particularly in the Borge Bay district. A possible reason for this was the absence of whalers in Borge Bay, so that fewer birds than usual were attracted to the locality.

Addled eggs in all the rookeries amounted to only 2 per cent, which is very low in comparison with other locally breeding petrels and in view of the rigorous climate and the exposed situation of the nests.

The iris of the Giant Petrel is generally pale greenish buff, but in the South Orkneys about one in twenty of the birds had pale china-blue irises. This colour has not been seen in South Georgia, nor, apparently, in the Falklands. All the birds with blue irises were found to be light intermediates, but since these comprised 75 per cent of the total, it does not follow that this correlation is exact.

Daption capensis (Linn.), Cape Pigeon.

The South Orkneys probably form the most populous breeding ground in the South Atlantic for this species. The South Shetlands and South Sandwich Islands give nesting places for many thousands, and a considerable number breed in South Georgia, but there are enormous numbers of nesting birds in the Orkneys during the season. The Scotia Expedition estimated the population of Laurie Island alone at 20,000, and at all the other islands in the group the birds nest in much larger numbers than on Laurie Island. On Weddell, Saddle and Fredriksen Islands many thousands congregate, and many parts of the steep coasts of Coronation and Powell Islands are occupied by nesting birds. Signy Island is also well populated.

An interesting fact, which holds also with the other open-cliff breeding petrels of the islands (*Priocella antarctica* and *Pagadroma nivea*), is that the birds never choose an unprotected southward-facing cliff on which to nest, no matter how favourable the site may appear. This was particularly noticeable on such islands as Saddle and Weddell, where the northern cliffs were dotted with sitting birds, while the south-facing cliffs, although clear of snow, were entirely uninhabited. The rule was found to be invariable, and where colonies were established among groups of rocky cliffs facing in several directions, if nests were present on any face which had a southerly component in its direction, it was always found that some protection, in the shape of a projecting spur of rock, or another cliff opposite, sheltered the nests from southerly winds.

In consequence, there are comparatively very few cliff-breeding petrels nesting along the south coasts of the islands, and then only where a turn in the coast, or an off-lying islet, affords a sheltered situation.

The reason for this circumstance must be that southerly winds are the chief snow-bearing winds in the breeding season, and are more bitter than winds from the northern semicircle.

The Scotia Expedition found that laying takes place in the first two weeks of December. Nests in the huge colony on the western side of Fredriksen Island were visited on January 4, and were found to contain hard-set eggs. About one nest in fifteen contained a newly hatched chick. The nests here were small hollows in the rocky ledges of the cliff, lined with a collection of small flat plate-like pebbles from a quarter of an inch to an inch in diameter. On the majority of nests only the brooding bird was present, but at a few both birds were seen. Some of the nests here were only about ten feet above the sea.

The birds are usually gregarious, and were nowhere found nesting singly. The colonies are scattered and individual nests may be placed some distance from the rest.

On January 9 the nests in the Sandefjord Harbour district contained hard-set eggs and chicks a day or two old in about equal numbers. These very young chicks, almost as soon as hatched, were found to inherit their parents' habit of ejecting the contents of their stomachs at the intruder. In this they showed even greater proficiency than the adults, attaining a longer range and more precision of aim.

The chicks are clad in dark smoky grey-brown down, which appears in some lights to have a purplish tinge. There are two lighter circles, almost clear of down, round the eyes, which give the chicks a peculiar spectacled appearance.

In the Sandefjord Harbour district, the nests of the Cape Pigeons are established on all the cliffs occupied by Silver-grey Petrels, and the nests of both birds are mixed on the rocky ledges. The Cape Pigeon nesting grounds extend to a lower altitude than those of their neighbours. Some of their nests are only about eight feet above sea-level, and the lower parts of cliffs which are occupied by the two species are in general held more numerously by Cape Pigeons. They have no objection to height, however, and are found at any altitude on the seaward-facing cliffs.

The Inaccessible Islands are the main stronghold of *Priocella antarctica*, and it might be expected that Cape Pigeons would nest there also. None, however, were seen, and since Cape Pigeons are almost always plentiful in the vicinity of their nesting places it is improbable that they breed there.

Snowy Petrels are also in the habit of nesting in company with Cape Pigeons and in Borge Bay nests of both birds were found in close proximity.

On January 19 the nests in the Cape Pigeon colonies near Borge Bay all contained chicks, ranging from about a fortnight old to newly hatched youngsters. When the birds were sitting on eggs they usually remained on the nest until lifted off, making no movement beyond ejecting their stomach contents. With chicks, however, it was noticed that when approached they assumed a defensive attitude, crouching with wings held

out from the sides, and facing round to the intruder. In either case they kept up a harsh scolding chatter. The regurgitations were always found to consist of an oily mess almost entirely composed of Euphausians.

In the Borge Bay colonies, where the nests were clustered fairly thickly, it was found that about one in four of the nests was unoccupied. These were apparently used as resting grounds by the mates of the sitting birds in the nests near by. The vacant nests seem to indicate that fewer birds than usual were breeding in this locality, owing probably, as with the local Giant Petrels, to the absence of whalers.

The proportion of rotten eggs was found to vary in the different colonies, but it averaged about 15 per cent. This is almost certainly due rather to the rigours of the climate than to infertility.

The Cape Pigeon is one of the few species which rarely visit the South Orkneys during the winter. In April the birds leave the group and become pelagic. In the South Atlantic their oceanic range in the winter lies some degrees farther north than their summer range, though probably a few birds would be seen almost down to the ice-edge in the winter. They rarely venture over the ice, and it is to this that their absence during the winter at the South Orkneys is in part due.

Pagodroma nivea (Forster), Snowy Petrel.

The Snowy Petrel breeds in considerable numbers on all the islands in the South Orkneys. It is also one of the commonest winter visitors, for in its oceanic range the bird prefers the vicinity of pack-ice.

The nests were usually found in the same localities as those of *Daption capensis*, and in similar situations, except that the Snowy Petrels often used more sheltered sites on the cliffs. Most of their nests were to some degree protected, either by an overhanging portion of rock, or by being placed in a cranny or corner on the rocky ledges. In several places it was found that favourable nesting sites were provided where the rock face was fissured with diagonal cleavage planes and sheltered ledges were formed.

The nest consists of a few small flat stones and scraps of rock debris, and is not usually so neat as the nest of *D. capensis*. The birds, in nesting, were found to be less sociable than the others of their order, and although in every favourable locality a number of nests were established, the individual nests were usually placed singly and well apart from each other. However, two or three nests were often to be seen on the same ledge.

The single eggs are laid in the last few days of November and in early December. On January 4, all the nests examined in the vicinity of Ellefsen Harbour contained chicks, ranging from a day or two to perhaps a week old. The chicks are clad in uniform pale pearl-grey down dorsally, and their under surfaces are dull white. Like the young of *D. capensis* they are proficient in ejecting their stomach contents. One parent bird was present on each of the nests visited here. When approached the birds raised the feathers on the crown, forming quite a noticeable crest, and kept up a harsh chatter similar to the defensive note of *D. capensis*. When driven from their nests they sometimes took wing and wheeled round in the vicinity, uttering a harsh call rather like the

sound of a watchman's rattle. This note was sometimes heard on other occasions when birds were flying close to the ship at sea, and it appears to be a scolding note. They were also heard to utter a quiet twittering, and on returning to their chicks made soft clucking sounds. The Snowy Petrel has thus a more extensive vocabulary than most of its relations.

On January 8 several nests in Sandefjord Harbour were visited. Of these all but one contained chicks, and in the exception the chick was just hatching.

In all, about fifty nests were examined throughout the South Orkneys, and all the Snowy Petrels seen apparently belonged to the one species *Pagodroma nivea*. Several sitting birds were measured, and it was found that the measurements were fairly regular. Almost certainly no larger birds were seen. Probably *P. confusa* is confined to the Ross Sea area, if indeed it is a distinct species.

Measurements of two nesting birds in Borge Bay were:

	mm.	mm.
Bill, length	24	23
,, breadth at base	7	7
Wing	268	265
Tail	107	109
Tarsus	32	30·5

The bill is black, the iris very dark brown, almost black. The plumage is entirely white, except for a few small filaments of feathers just before the eye, which are bluish black. Often when the birds are seen flying it appears certain that there is a patch of grey pigmentation about the under wing-coverts. All the captured birds were examined but no trace of it was found, and it seems that the grey appearance must be an illusion due to shadow. The legs and feet are dark bluish grey, darker on the toes and claws.

Priocella antarctica (Stephens), Silver-grey Petrel. (Plate XI, fig. 2.)

The Silver-grey Petrel has for some years been suspected of breeding in the South Orkneys, but nests had not apparently been found there before the visit of the 'Discovery II'.

The bird breeds in large numbers round the south-western and north-western corners of Coronation Island, where it was estimated that 25,000 nests are established. The nesting grounds seem to be entirely confined to this end of the main group of islands, for although a sharp look-out was kept, nowhere else was there any sign of their breeding.

The Inaccessible Islands are, however, the main stronghold of the species. The northern cliffs of all three islands were, on January 25, seen to be dotted with nesting birds from top to bottom, the total number of nests being estimated at not less than half a million. The birds were apparently the only petrels breeding on these islands. On Middle Island, a rookery of Ringed Penguins is established on a steep bluff, and nests of the Silver-grey Petrels were scattered among the penguins.

The only previous occasions on which this species has been found nesting was by Nordenskjold's Swedish Expedition, who found the birds breeding on Cape Roque-

maurel in Graham Land, and by the Australasian Antarctic Expedition of 1911–14 in Adélie and Queen Mary Land.[1] The nests and young appear not to have been described.

On January 9 and 10, about forty nests were examined in the Sandefjord Bay district. Of these twelve contained chicks a day or two old and in the remainder the eggs were on the point of being hatched. The date of laying must thus be about the same as that of *Daption capensis*.

The nesting sites and nests are very similar to those of *D. capensis*, except that generally more sheer and inaccessible locations are chosen. The nest consists of a collection of small flat stones, and the single egg is white, very similar to that of *D. capensis* but slightly larger. A thin chalky coating was found to be present on all the eggs examined.

The chicks are covered in uniform silvery grey down, lighter on the under surface, and they have the blue-grey and rose-pink bills of their parents from birth (Plate XI, fig. 2).

At the nests visited only one parent bird was present in most cases, but at a few the pair were seen. On being approached the birds, after the usual manner of petrels, ejected their stomach contents, and uttered a harsh high-pitched chatter, from time to time punctuated with a shrill squeaking note.

Measurements of several birds ranged between

	mm.		mm.
Bill	46	and	49
Tarsus	53	and	55
Wing	330	and	342

The feet, legs and toes are blue-grey, the webs pinkish purple, and the claws grey-black. The upper mandible is mainly blue-grey with patches of pinkish and a black patch near the nares. The tip is grey-black. The lower mandible is rose pink, with a dark grey tip.

This species is very similar to the Cape Pigeon in its general habits, and the two birds are very frequently seen in company at sea. Probably they leave their breeding haunts in the South Orkneys at about the same time, and there is no record of *Priocella antarctica* being seen at the islands in the winter.

The bird breeds in large numbers on the South Sandwich Islands, particularly in the Southern Thule group, and in considerable numbers on Bouvet. At both these places again they share their breeding grounds with *Daption capensis*. There are indications that the Silver-grey Petrel also nests on some of the off-lying islands of the South Shetlands, but the South Orkneys may be regarded as the South Atlantic headquarters of the species.

Thalassoica antarctica (Gmelin), Antarctic Petrel.

Throughout the visit of the 'Discovery II' not a single Antarctic Petrel was seen in the vicinity of the South Orkneys, and it is certain this bird does not nest in the group.

[1] It is believed that nesting places were found in the Enderby quadrant by Sir Douglas Mawson's expedition of 1929–30.

Probably the species only occurs when the islands are surrounded by pack-ice, or when ice is in the vicinity, for in its oceanic range the bird was very rarely found to stray more than about fifty miles from the edge of the ice.

In February 1931 several birds were seen at the ice-edge about fifty miles north of Laurie Island, and in December of that year, one at the ice-edge sixty miles north of Coronation Island. In November 1932 birds were observed thirty miles south of Scotia Bay, the ice being then about sixty miles south of the land. The Scotia Expedition saw a number of birds near Saddle Island about the end of March, and doubtless ice was near the islands at that time.

The Antarctic Petrel, then, is only a casual visitor. No breeding ground of the species is known in the Weddell area, but it is highly probable that one exists, for a fair number of birds are always to be seen at sea along the Weddell ice-edge. In the Bellingshausen Sea it is possible that the bird breeds on Peter Ist Island.

Pachyptila desolata banksi, Smith, Dove Prion.

This bird was only found nesting on Signy Island, and since the kind of ground required by the species for breeding is practically confined to Signy, it is probable that it is the only nesting place. The Scotia Expedition did not find the bird on Laurie Island.

The nests are made in crannies among the tumbled rocks on the screes, mainly about the sloping parts of the land in preference to the cliffs. In the Borge Bay district there are many flat laminated boulders lying about the moss-clad slopes, and underneath these many nests were found. The nature of the ground usually precluded the digging of burrows, which is the habit of the birds in other localities.

The nests are merely shallow hollows in the earth or rock debris in which they are made—a few feathers may form an inadequate lining. In January the slopes on which the birds were breeding were saturated with melted snow, and numbers of nests were very damp.

Between January 17 and 21 about 120 nests were examined. Of these, forty contained single eggs, most of which were freshly laid. The most advanced egg was no more than a week incubated. The remaining nests had not yet been laid in, and in at least half of them an old and rotten egg from the previous year was found. That so many eggs should fail to hatch is not surprising when one considers the lateness of the breeding dates. In South Georgia the eggs are laid at least six weeks earlier, and the young do not usually leave the nests until April. By that time winter conditions are prevailing in the South Orkneys, and it is a matter for wonder that any chicks are able to survive.

The Prions are not usually seen very near pack-ice and apparently do not like it. It is probable that they wait until Signy Island is clear of pack before they come ashore to breed, but later in the season the ice must often be a source of great inconvenience to them.

In most of the nests in which no eggs were found, both parent birds were present in the daytime, but in the nests with eggs only the sitting bird was present. Prions are

nocturnal in their habits in the vicinity of land; they were never seen outside their nesting holes in the daytime, nor were they observed anywhere close to the shore at sea. At dusk they returned from sea, and flitted about in the vicinity of their nests. At this time the birds in the nests all commenced intermittently to give their low throaty call, and a continuous murmur could be heard all about the colony, leading to the discovery of many hitherto unsuspected nests.

This species is evidently the only Prion breeding in the islands, for all the birds seen belonged to it, nor were any of the other kinds recognized at sea in the vicinity. The birds in the South Orkneys are in every way indistinguishable from the South Georgian birds. The eggs are similar, the plumage similar, and series of measurements of birds from the two localities are as follows:

	South Orkneys				South Georgia		
	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Bill, length	29	30	29	30	29	30	—
Breadth of bill at base	14·5	15	15·2	14·5	13·5	14·5	14
Tarsus	33	33	32	32	29·5	32	—
Wing...	191	196	194	198	198	198	—

Large numbers of the birds on Signy Island fall victims to skuas. Several skuas' nests were found in the vicinity of Borge Bay, and in every case the ground in the vicinity of the nest was thickly strewn with the remains of Prions. The skuas apparently caught them at dawn when they left their nests, or at dusk on their return from sea.

Although Prions were never seen near the islands in daytime, in the surrounding seas they are usually very numerous. In February 1931 forty were seen thirty miles south of Coronation Island, and twenty at a position forty miles north of the island. In November at least a thousand were observed between ten and sixty miles south of Scotia Bay, and in January about 1500 between twenty and a hundred miles north of Laurie Island. Almost certainly these were all *P. d. banksi.* The islands were several times approached when they were surrounded by pack-ice, and on these occasions no birds at all were seen within ten miles of the ice.

Halobaena caerulea (Gmelin), Blue Petrel.

This species probably deserves a place among the birds of the South Orkneys on the strength of a report by one of the members of the crew of the 'Discovery II'. Ordinary Seaman A. Jones reported on January 18 that he found two Blue Petrels breeding on the slopes above Borge Bay. The nests were among those of *Pachyptila desolata banksi*, and in similar sites. He was unable to capture the birds, but obtained an egg, which was unfortunately broken later. It was similar in size to that of *P. d. banksi*, but more elongate-ovate in form than is usual with the eggs of that bird.

He described the birds as having "white-tipped tails and more black about the head than Prions", and there seems little doubt that the report is authentic. Jones had taken a great interest in birds at sea, and was able to identify many species. A diligent

search was carried out in the locality during the following three days, but no more nests were found or birds seen.

The Blue Petrel is fairly frequently met with at sea in the South Atlantic, and is common in the Weddell Sea. In November 1931 three were seen about 300 miles north-west of the Orkneys. The Scotia Expedition captured two about 300 miles south-east of the group. On January 1, 1933, twelve were seen between twenty and a hundred miles north of Laurie Island, with Prions. On this day the number of Prions was estimated at 1500, so that if the Blue Petrel nests on Signy Island in numbers proportionate with the numbers of the two species seen at sea, it is not surprising that only two nests were found. On other occasions a few birds were seen between the South Orkneys and Elephant Island, and again north of Elephant Island.

Oceanites oceanicus (Kuhl), Wilson's Storm-Petrel.

Wilson's Petrels are extremely abundant at the South Orkneys in the summer, being probably even more numerous than the Cape Pigeons. They breed round the coasts of all the islands. The nests, hidden in crannies among the rocks of the cliffs and screes, are difficult to find, and it would be easy to underestimate the population, particularly as the birds are mainly nocturnal.

Eagle Clarke, in his account of the birds of the Scotia Expedition, comments on the remarkable regularity of the dates at which this species makes its annual appearance at the South Orkneys. November 11 and 12 were the dates on which the Scotia Expedition saw the first birds. This regularity has been remarked in the South Shetlands also. Usually, in the summer, Bransfield Strait literally teems with birds, but on November 6, 1932, not a single bird was seen there. The next day several were observed north of Elephant Island, and in the following days increasing numbers were seen in the Scotia Sea. On November 20 birds were present in numbers near the South Orkneys. The second week in November is evidently the regular time of the species' annual arrival in this locality.

The egg-laying dates appear to be subject to no such regularity. The Scotia Expedition found the first egg on December 11. This must have been a very early laying, for Eagle Clarke states that no chicks had hatched by February 21 of that year. Possibly the egg was unfertile. We found the first egg on January 4, in Ellefsen Harbour, but several nests in this locality had not yet been laid in, though sitting birds were present at nightfall. In Sandefjord Harbour, where the birds are very numerous, twenty-four nests were examined, but none of them were laid in on January 10. Between January 17 and 20 two hundred nests were examined on Signy Island, and in about fifty of these freshly laid eggs were found. This lateness in breeding imposes an enormous disadvantage on the birds, and in view of their arrival at the islands a full two months earlier, it is difficult to account for it. That a heavy toll is exacted is proved by the fact that nearly half of the nests contained either rotten eggs from a previous season, or remains of dead young. These old eggs were usually turned out of the actual nest hollow, and lay near by in the cranny.

The nests are merely shallow depressions in the soil or rock debris in the crannies in which they are made, and the birds show very little intelligence in their choice of sites, except that they always select a hole with a narrow entrance. In one case in Ellefsen Harbour, and in five cases in Sandefjord Harbour, the nests were actually made in blocks of ice which had evidently formed among the rocks during the winter. The birds almost certainly return year after year to the same situations, and in these cases had not sufficient initiative to forsake their nests when they found them iced in.

The birds were only seen in small numbers near to the coasts in daytime, but in the evenings they were present in large numbers in all the harbours visited, flitting about in flocks over the surface of the water, and apparently feeding. At dusk they were continually flitting round the cliffs and screes, and creeping mouse-like about the entrances of their nesting holes where their mates were on the nests. At this time they frequently utter a loud and characteristic cry, consisting of a harsh call of three notes, the first being about half as long again as the two following. To this the mate responds from inside the nesting hole with a similar call in a slightly lower key, and with the second and third notes more drawn out. This call is extremely loud, and on a still night can be heard at a distance of a mile or more. At times, from inside their nesting holes, the birds make a low whistling note. On several occasions, when in a boat very near to feeding birds flitting about in flocks in the harbours, we heard them utter small mouse-like squeaks, just audible. These notes were accentuated when a number of birds were gathered about a scrap of food.

In Sandefjord Harbour on January 10 some birds were observed possibly courting, for among three squatting by a large rock two males were evidently making overtures to a hen. One of the males eventually departed, but pairing was not seen to take place.

The Scotia Expedition last saw Wilson's Petrels at the South Orkneys on March 23, but in view of the lateness of their breeding dates it is probable that they do not usually leave the islands until well into April. On April 14, 1930, many birds were seen just north of the South Shetlands, and no doubt these were moving northward. By early May there are no Wilson's Petrels to be seen in the high latitudes of the Southern Ocean, and during the winter they are entirely absent. The majority of them no doubt perform the long migration to the high northern latitudes.

Fregetta tropica melanogaster (Gould), Eastern Black-bellied Storm Petrel.

This bird visits the South Orkneys in small numbers in the summer, and its breeding grounds are almost certainly confined to Laurie Island. At dusk small numbers of birds were seen, with *Oceanites oceanicus*, on different occasions in Jessie Bay, Scotia Bay, Wilton Bay and Marr Bay. Two were seen in the daytime in Washington Strait, but although a sharp look-out was kept not a single bird was seen to the westward. No nests were found anywhere but on Laurie Island.

The Scotia Expedition found a nest in Uruguay Cove, and Eagle Clarke states that on December 5 it contained a deeply incubated egg and that both birds were present in the nest. This date seems very early indeed, and the fact that both birds were present

leads one to suspect that the egg was a well-preserved unhatched specimen from the previous season, for among the southern petrels it is uncommon to find both birds of a pair at the nest after the egg is laid.

In the course of our work two nests were found in crannies among rocks on the steep slopes of the eastern side of Wilton Bay, at a height of about 150 feet. In both these the egg was fresh, not laid more than a few days, and a single parent was present in each case. This was on January 28, so that the egg-laying dates must coincide closely with those of *O. oceanicus*. One of the sitting birds was captured and preserved. The bill, legs and feet are all black, and the iris very dark brown.

Bennett (1926) comments on a peculiar whistling note which he believes this bird to utter in the neighbourhood of its nest. Eagle Clarke also mentions a whistling from the nest. This habit is not, however, confined to this species, for Wilson's Petrels are often heard to make similar sounds.

The two birds seem to be very similar in their habits, with one notable exception. Wilson's Petrels nearly always follow in the wake of a ship at sea, while *Fregetta tropica melanogaster* is usually seen flying ahead of or around a ship and rarely follows the wake. It also appears to be a much more agile bird on the wing, and the following note was made on birds observed at sea between the South Orkneys and South Shetlands: "The flight of these birds was again seen to be most distinctive. They fly rapidly along about four feet above the surface of the sea, and at intervals make a series of short, oblique dashes down to it, striking it with the feet held out and 'skating' for a distance of three or four feet, raising a considerable splash."

The birds are moderately common in the high latitudes of the South Atlantic in summer; and in the Drake Strait, Scotia Sea, and the vicinity of the South Orkneys and South Shetlands, small numbers are recorded as having been observed on almost every day that the 'Discovery II' was at sea. In the winter they probably migrate to lower latitudes.

Bennett found this bird breeding in small numbers on Deception Island, and it is probable that the eastern islands of the South Shetlands also furnish breeding grounds.

Catharacta skua lönnbergi, Matthews, Brown Skua.

A great deal of confusion has prevailed with regard to the subspecific races of the Great Skua, and in recent years the southern skuas have received considerable attention. The latest analysis by Hamilton (1934) is an important contribution to the subject. A long series of the measurements of *mated pairs*, from the South Shetlands and South Orkneys, is required to confirm his conclusions. This might prove that the birds of Hamilton's two subspecies interbreed, in which case the subspecific characteristics are no longer valid. On the other hand, if the opposite were proven his case is beyond question. It may be noted that Bennett (1926, p. 319) states that in the South Shetlands he observed that breeding pairs were alike in size.

Hamilton was only able to measure thirteen specimens from the South Orkneys, twelve from the South Shetlands, and nine from South Georgia, and he remarks on the

fact that the greatest size variations are found in the longest locality series of measurements. Field observations lead me to suspect that the South Orkney skuas vary in size to a much greater extent than is suggested by his figures.

A male bird shot in Ellefsen Harbour measured—wing, 419 mm.; culmen, 51 mm.; tarsus, 79 mm.—this was noted to be a "large" bird. Several more were shot in Borge Bay, both "large" and "small", but the measurements were unfortunately lost.

Hamilton remarks on the unreliability of field observations alone when the size of birds is in question. In this he is right, but when several birds together are closely observed ashore it is sometimes possible to detect differences in size. Certainly the majority of the South Orkney birds appeared to be "large".

Skuas are common in summer all round the group, being probably most numerous in the vicinity of the penguin rookeries. On January 5 nests in the vicinity of Ellefsen Harbour contained hard-set eggs, and on January 8 eggs in the nests in Sandefjord Harbour had reached approximately the same stage. A great diversity of size and colouring is apparent in the eggs; the ground colour varying from olive-brown to blue-green.

In Borge Bay the breeding operations were much farther advanced, for on January 17 five nests were found, belonging to which were three single chicks and two pairs. The chicks varied in age from a few days to perhaps five weeks, the latter being lanky youngsters with the quills of their first plumage replacing the nestling down. The Scotia Expedition found chicks a week old on January 29 on Laurie Island and it is evident that the breeding dates must be subject to considerable variation.

In the Borge Bay district the ground in the vicinity of the nests was littered with the remains of Prions, and it was clear that these formed the staple diet for the local skuas, for there were no remains of any other species. In other parts the birds subsist to a great extent on the eggs and young of penguins.

The nests, comfortably lined with lichens and moss, are usually placed on the crests of local eminences, and their immediate vicinity is shunned by other nesting birds. This ensures comparative safety for the skua chicks, which leave the nest very soon after hatching and wander about in the neighbourhood, where they would soon fall a prey to Giant Petrels if any were established close by.

The Scotia Expedition found that no skuas remained in the South Orkneys after April, and they were never seen during the winter. It would be interesting to know to which coast they resort during the winter months, for although skuas are sometimes seen at great distances from land, it is highly improbable that the sub-Antarctic skuas spend the winter in a pelagic condition.

During the winter cruises of the 'Discovery II' between South Africa and New Zealand and the ice-edge, only one skua was seen farther than 500 miles from land or south of latitude 45° S. The exception is a solitary specimen seen in 49° S, 120° E towards the end of May.

Catharacta skua maccormicki (Saunders), McCormick's Skua.

An example of this bird was obtained in Scotia Bay by the Argentine naturalists in

November, 1904. During the visit of the 'Discovery II' no birds were seen in the group, and the normal limit of range of McCormick's Skua lies several degrees to the southward. The species no doubt occurs from time to time as a straggler, and the most likely times for its appearance would be during the spring and the autumn.

Bennett states that he has seen a few birds in Graham Land, but during the periods that the 'Discovery II' was in this locality the bird was never definitely identified. Hamilton (1934) states that he did not find the bird in the South Shetlands although formerly it bred there.

Larus dominicanus, Licht, Southern Black-backed Gull.

This bird breeds in small numbers round most of the coasts of the South Orkneys, and during the entire month we spent at the group a few birds were nearly always in sight from the ship. In all the harbours and straits some were present, and at frequent intervals round the coasts one or two birds would appear and remain in company for short periods. The only area where they were comparatively scarce was along the north coast of Coronation Island, where the steep cliffs of the shore allows of no suitable nesting grounds. The Scotia Expedition estimated the summer population of Laurie Island at about three hundred birds, and probably twice that number nest among the other islands of the group.

The gulls are the earliest breeders of all the South Orkney birds, for their eggs are laid in the latter half of November. In South Georgia breeding takes place at about the same time. Bennett (1926, p. 318) states that in the South Shetlands the bird breeds six weeks earlier than in the Falklands. This species is practically the only exception in the south to the usual rule that birds with a wide latitudinal breeding range lay their eggs progressively later the higher the latitude of their nesting places.

Several nests were found round Ellefsen Harbour, but the chicks had all left in early January and none were seen. The brownish chicks are always difficult to see on stony ground, and on the approach of an intruder they often remain quite still, rendering themselves almost invisible.

The nests consist of scraps of lichen, feathers and seaweed, and are easy to find even after they have been vacated, on account of the number of limpet shells which always lie scattered around them. All the nests found were on rather flat ground, usually on the top of low slopes behind the beaches. A number of nests were present in the Borge Bay district, and here two chicks were observed. In these birds almost all the down was gone, and they were estimated to be at least six weeks old on January 18.

Bennett is of the opinion that the South Shetland gulls are subspecifically different from those of the other parts of the South Atlantic. No noticeable superficial difference is to be observed in the South Orkney birds.

The Scotia Expedition found that a few gulls remained throughout the winter. These were possibly induced to stay by the presence of the ship, but the birds would no doubt be able to sustain themselves through the winter. A principal article of their diet is the limpets which are found on the rocks in many parts of the coasts, and these would always be obtainable.

Sterna hirundinacea, Lesson, South American Tern.

The Scotia Expedition found this species breeding on Laurie Island to a total number of from two to three hundred birds. During the visit of the 'Discovery II' no nests of terns were examined on Laurie Island, and only a few birds were seen, usually singly, at sea round the coast. The localities in which they were found nesting by the Scotia Expedition were not visited, but no doubt the birds still use these breeding places.

Sterna vittata georgiae, Reichenow, Wreathed Tern.

Both this bird and *S. hirundinacea* breed in the South Orkneys, and the Scotia Expedition found that the terns breeding on Laurie Island were all of the latter species. It is impossible to differentiate between the two birds by field observation alone during the breeding season, and as only one tern was captured during the visit of the 'Discovery II', we were not able to identify the species inhabiting some of the colonies. I am of the opinion, however, that most of the terns breeding in the group belong to the species *S. v. georgiae*, with the exception of the Laurie Island birds, which were not closely observed.

A small ternery is established on the low islet forming the south-eastern boundary of Ellefsen Harbour. This was visited on January 5, and found to contain about fifty nests. Most of these contained single hard-set eggs, and one newly hatched chick was seen. The nests are shallow depressions in the rubble lying among the rocks, and are lined with small pebbles.

A number of terns were seen off Fredriksen Island and in Lewthwaite and Washington Straits. Along the north and west coasts of Coronation Island they appear to be entirely absent, for these coasts provide no suitable nesting sites. Only three birds were seen in Sandefjord Harbour during a stay of several days.

Signy Island, however, provides breeding places for perhaps a thousand birds. Two considerable colonies are established on the shores of Borge Bay, the nests being placed high up on the beaches and on the rising ground at the back of them. All the nests examined contained single eggs, and on January 16 these were all about half-set. Thus, with this species again, the breeding dates on Signy Island are later than those of the birds in Ellefsen Harbour. A few patches of snow were still lying about the slopes of the land in Borge Bay, and probably this more sheltered area would carry more snow than would the comparatively wind-swept islets about Ellefsen Harbour. Consequently the Ellefsen Harbour sites would be clear of snow earlier in the summer and this may account for the difference in the breeding dates.

The nests in the colonies in Borge Bay were found to be spread over a considerable area of ground. Sometimes two or three nests might be placed within a few feet of one another, but as a rule they were widely scattered. No birds, however, were found nesting in complete isolation.

Terns which breed in high latitudes are usually migratory, and it is probable that this species is entirely absent from the South Orkneys during the winter. There appears to be no record of its occurrence at the group during the winter months.

Phalacrocorax atriceps, King, Blue-eyed Shag.

Blue-eyed Shags breed in colonies on a number of detached rocky islets throughout the South Orkneys. No rookeries were found anywhere on the main islands. They are probably most numerous round Laurie Island, where the Scotia Expedition estimated the summer population to be about 2500 pairs.

A large rookery is established on Holmen Gras Islet, just south of Ellefsen Harbour, and another on the southernmost of the Inaccessible Islands. On several islets the birds share their rookeries with Ringed Penguins. Since the rocks are usually steep-to, the Ringed Penguin is the only species which would choose to nest on them. In the Palmer Archipelago shags are found sharing their rookeries with Gentoo Penguins.

The rookery on Holmen Gras was visited on January 5. The nests all contained two or three chicks, varying in age from a few days to about a fortnight. The chicks are completely bare at birth, the skin of the back being brown-black, and of the underparts pink. After a few days they are covered in brown-grey down. In the chicks the bill is mainly brown, the lower mandible being pinkish bluish at the base, shading into brown at the tip.

In the adult birds the bill is dull grey-brown, the lower mandible being paler at the tip. The feet are pinkish, turning into brown-black at the edges of the webs. The birds had lost their nuptial crests at this time, and the caruncles were faded yellow.

On January 5 when a survey party was landed on the beach of a small bay on the western side of Fredriksen Island, a flock of shags came swimming slowly in from the northward, approached to within a few yards of the shore and moved off to sea. The flock was in perfect arrowhead formation and the birds were closely packed in the flock. There were about two hundred of them, and as they swam slowly along with only their snake-like heads and necks showing above the water they presented an extraordinary spectacle. It was considered likely that these birds were from some near-by colony, possibly Holmen Gras, on a foraging expedition, and that they were attracted towards the beach by the presence of the boat.

On January 26 a rookery on the islet on the western side of Wilton Bay, in Laurie Island, was visited. About 180 nests are established here. The young were all in first plumage and had left the nests. They wandered about the rookery, which was in a very filthy condition, and when disturbed showed little inclination to take to the sea. A few of them swam, but it was evident that they were not yet proficient in the water. These birds were considered to be six or seven weeks old, and at this stage the caruncles are not developed, the eyelids are greyish without a trace of blue, and the legs and feet are grey-brown, with pinkish patches in the webs. The bill is similar to that of the chick.

The Scotia Expedition saw only a few birds during the winter. It is suggested that the majority migrate to the Patagonian Islands, for on April 15, 1930, a number of shags were observed near the ship in a position 150 miles south-south-east from Cape Horn. These were definitely *P. atriceps*, and it seems likely that they were Antarctic birds on migration, for it is improbable that birds from Tierra del Fuego would stray so far afield.

Chionis alba (Gmelin), Sheathbill. (Plate XII, fig. 4.)

Sheathbills are common among all the penguin rookeries in the South Orkneys, and even small isolated branches of colonies, containing only a few penguins, are usually found to include at least a pair of the birds. They show no apparent preference for the company of any particular species of penguin, but they are rarely seen far from a rookery.

The Scotia Expedition estimated the total population of Laurie Island at two to three thousand birds, and since the number of Sheathbills probably follows closely in proportion with the number of penguins, the population of the whole group must be about twice that number. Our estimate of the population of the group, exclusive of Laurie Island, was about three thousand birds.

Nests were found in Ellefsen Harbour on January 4, and on this date all of them contained eggs. Most of these had not long been laid, but a few were deeply incubated.

In Sandefjord Harbour, on January 9 a number of nests contained eggs in various stages of incubation, but no chicks were found. Two of these nests contained four eggs; in all the rest two or three were found. In Borge Bay two nests were found on January 18 containing half-set eggs. The Scotia Expedition found chicks on Laurie Island on January 7, and it appears that with this bird, as with some others, the breeding dates are slightly later in the western end of the group than in the eastern part.

On January 9 an empty Sheathbill's nest was found in Sandefjord Harbour. Whether this had not yet been laid in or had been robbed it is impossible to say, but the two birds were standing on a rock near by, going through what was evidently a courtship ceremony. They stood facing one another about two feet apart and, keeping their positions, together performed a series of quick little bows, in a stiff mechanical movement from the hips so that at each bow the tail was elevated. After fifty or more of these bows both birds remained quite still for a moment, when they commenced a further series. This performance was continued for fifteen minutes, when the birds appeared to tire of it and resumed their customary quick inquisitive hopping about the rocks. Pairing was not seen to occur.

The nests, usually placed in well-selected holes among jumbled rocks, consist of collections of penguins' tail feathers, remains of egg-shells, small stones, scraps of lichen and miscellaneous rubbish, together with disgorged pellets of indigestible matter. The ground round the actual nest is always strewn with these materials (Plate XII, fig. 4). When the nest is approached, the sitting bird will often commence a harsh chatter, finally fleeing with alarmed cackles.

Sheathbills are practically omnivorous, but a great part of their diet in the South Orkneys consists of penguins' eggs, faeces, and young. The latter they usually find dead, but no doubt they would not hesitate to hasten the end of a dying youngster. They have the skuas as rivals, with whom they find it impossible to compete, and probably few young penguins are actually killed by Sheathbills. Mr A. Saunders, the laboratory assistant, saw two Sheathbills attacking an ailing penguin chick on one occasion.

The Scotia Expedition found that a few birds remained throughout the winter in the neighbourhood of the ship's winter quarters; and the Argentine meteorologists stated that a few remained in the vicinity of their hut nearly every winter.

Except for these birds, which find artificial means of sustenance, it is almost certain that the Sheathbills leave the islands during the winter, for it would be extremely difficult for them to find sufficient food when almost all the other birds had departed.

It is suggested that they migrate to the islands and channels off the coast of Patagonia, where they are believed to occur during the winter. Several birds were seen at sea off Cape Horn from the 'Discovery II' in the middle of April 1930, and two days previously one was in company with the ship, then northward-bound, midway between the South Shetlands and Cape Horn. These were the only occasions on which a Sheathbill was seen far from land during the cruises of the 'Discovery II'. At sea the birds perched about the ship and flew at a considerable height above the surface of the water. They were never seen to feed, and they probably perform their sea migrations without feeding.

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PLATE X

Fig. 1. *Pygoscelis antarctica* and chicks. Sandefjord Bay, Coronation Islands, 10. i. 33. The chicks are only about two days old and the nest is still almost intact.

Fig. 2. *Pygoscelis antarctica* climbing to their nests on a steep slope in Sandefjord Bay. The rock here does not always afford good foothold and very great difficulty is experienced by the birds in landing and climbing to their nests in this and similar situations.

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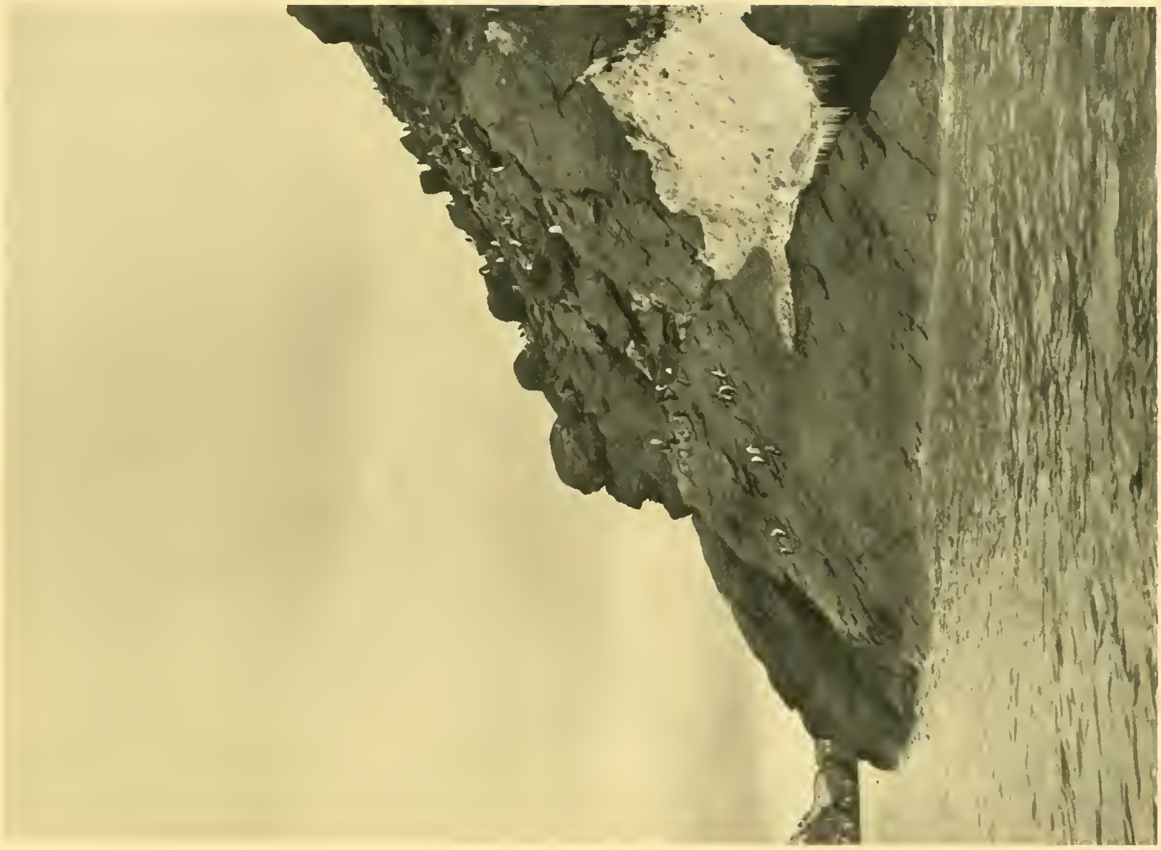

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A. Saunders phot.

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BIRDS OF THE SOUTH ORKNEY ISLANDS

PLATE XI

Fig. 1. *Pygoscelis adeliae* coming ashore at the rookery on Michelsen Island, Ellefsen Harbour. The birds have just left the sea and are comparatively clean. The apparently aimless behaviour of the birds is customary when they are away from their nests.

Fig. 2. *Priocella antarctica* and chick in a nest in Sandefjord Bay, 10.i.33.

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BIRDS OF THE SOUTH ORKNEY ISLANDS

PLATE XII

Fig. 1. *Macronectes giganteus* and chick. Signy Island, 19.i.33. The bird is a "dark intermediate" and the chick is in light grey down.

Fig. 2. Colony of *M. giganteus*, Michelsen Island, Ellefsen Harbour, 4.i.33. The general lightness in plumage of the nesting birds is illustrated. Two white birds are in the centre, and all the rest, with the exception of the bird in the left foreground, are "light intermediates".

Fig. 3. *Pygoscelis papua* feeding young, Ellefsen Harbour, 13.i.33. The parent bird has climbed on to the rock in order more conveniently to carry out the operation, the chick being almost as large as itself.

Fig. 4. *Chionis alba*. Ellefsen Harbour, 12.i.33. Three birds standing in a characteristic statuesque pose on a rock which contains a nesting hole. The approach to the hole is littered with rubbish which appears lighter than the surrounding rock.

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Figs 1, 3, 4 A Saunders phot
Fig 2 R A B Ardley phot

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BIRDS OF THE SOUTH ORKNEY ISLANDS

[*Discovery Reports. Vol. XII, pp.* 377–440, *August*, 1936.]

LARVAE OF DECAPOD CRUSTACEA

PART I. STENOPIDEA
PART II. AMPHIONIDAE
PART III. PHYLLOSOMA

By

ROBERT GURNEY, D.Sc.

CONTENTS

LARVAE OF DECAPOD CRUSTACEA

By Robert Gurney, D.Sc.

(Text-figs. 1–42)

INTRODUCTION

The collection of decapod larvae from the Discovery plankton is so large that it seems hardly possible to deal with it as a whole. It has occupied a great deal of my time for several years, but much remains to be done, and it has seemed best to simplify the task a little by reporting upon sections of the material without regard to systematic order.

Although these collections contain an astonishing variety of larval forms, many of which are of great interest, the proportion of early to late stages is remarkably small, and it is consequently rarely possible to fit together any complete series of stages. The material is particularly rich in larvae of very large size, but very small larvae are hardly represented at all. Even among the Sergestidae, for example, although mastigopus stages abound, elaphocaris and acanthosoma stages are rare, and of *Lucifer* I have seen larvae in one sample only.

The majority of plankton samples were taken far out at sea, a fact which may account for the absence of early stages of littoral species, but not for those of the many deep-sea forms of Caridea.

PART I. STENOPIDEA

Such knowledge as we have of the development of *Stenopus* is derived from the work of Brooks and Herrick (1891) and of Cano (1892) on *S. hispidus* and *S. spinosus* respectively. Brooks and Herrick were able to study the larva hatched from the egg, so that the characters of this first stage are established with certainty, but none of the later stages described belonged to *Stenopus* at all (Gurney, 1924, p. 133). Cano did not state by what means he identified his larvae, but there is no reason to doubt that they belonged to *Stenopus*, and he was able to describe a series of stages leading to a larva of very large size which was later met with by Ortmann and described under the name of *Embryocaris stylicauda* (1893).

I am indebted to Dr J. F. G. Wheeler for specimens of *Stenopus hispidus* hatched from the egg at Bermuda, and have included a description of this stage, since Brooks and Herrick's account is not quite clear in some particulars. These specimens also enable me to correct an error in the series of stages which I described in 1924. I then regarded as stages I and II two larvae which were taken together in one sample and were assumed to belong to one species. It is now clear that the specimen referred to stage I belongs to quite a different species, later stages of which are found in the Discovery material. In this material there are no small stages, but an embarrassing number of different forms, no less than nine being distinguishable.

It is naturally impossible to attach these to their adult species, the only species which can be definitely identified being *S. hispidus*; but it may be convenient to set out the possibilities. The following genera of Stenopidea have been described:

	No. of species	Atlantic species
Stenopus, Latreille, 1829	8	4
Stenopusculus, Richters, 1880	3	–
Spongicola, De Haan, 1850	6	3
Spongicoloides, Hansen, 1908	1	1
Richardina, A. Milne-Edwards, 1881	4	2
Engystenopus, Alcock, 1895	1	–

It is known that *Richardina spinicincta* has very large eggs (2 × 1·34 mm.), so that it is possible that the larva is hatched in an advanced condition; but it is also at least possible that there is a free larva, as there is in *Axius* which has still larger eggs. On the other hand, Caullery (1896) states that *Spongicola koehleri* has eggs 2 mm. long containing an embryo with all the appendages, in which case no free larva may be expected. In such circumstances any attempt to attach these larvae to species of adults is out of the question, but the variety of form is so striking that it is of interest to place it on record.

Table I shows the distribution of the larvae, and it should be noted that many of them were taken on the cruise up the east African coast. The depths of the hauls are given, but as the net was usually brought open to the surface they do not afford good evidence for the depths at which the larvae were taken.

I have included in the material dealt with in this report a number of specimens found in a sample of plankton taken by the 'Atlantis', the research ship of the Wood's Hole Biological Station, at St. 1121. This sample was left for examination at the Bermuda Biological Station, and I am indebted to Dr Wheeler for permission to handle the decapod larvae contained in it. The sample is remarkably rich in these larvae.

Stenopus hispidus (Olivier) (Figs. 1–3)

The larva hatches as an inert prezoea in which the rostrum is bent down under the body, and the setae of the limbs are not protruded. It moults in a few hours into stage I.

STAGE I (Fig. 1 *a–j*). Length 4·1 mm., including rostrum of 1·3 mm.

Rostrum with a few small denticles at end. Carapace without supra-orbital spines, rounded behind. Abdominal somite 1 with pleura drawn out on either side into a long straight spine, and with a small tooth dorsally on either side. Somite 2 without spines. Somite 3 with a pair of lateral spines and a long curved dorsal spine. Somite 4 without spines, but with a few dorsal hairs. Somite 5 with a small dorsal spinous process and a large median ventral procurved process. Telson with small teeth along outer margin, and each angle produced as a stout spine; posterior margin with five long feathered spines and a short seta on either side. The spine at the angle is evidently homologous with spine 1 of the normal telson, while spine 2 is reduced as in Thalassinidea and Anomura.

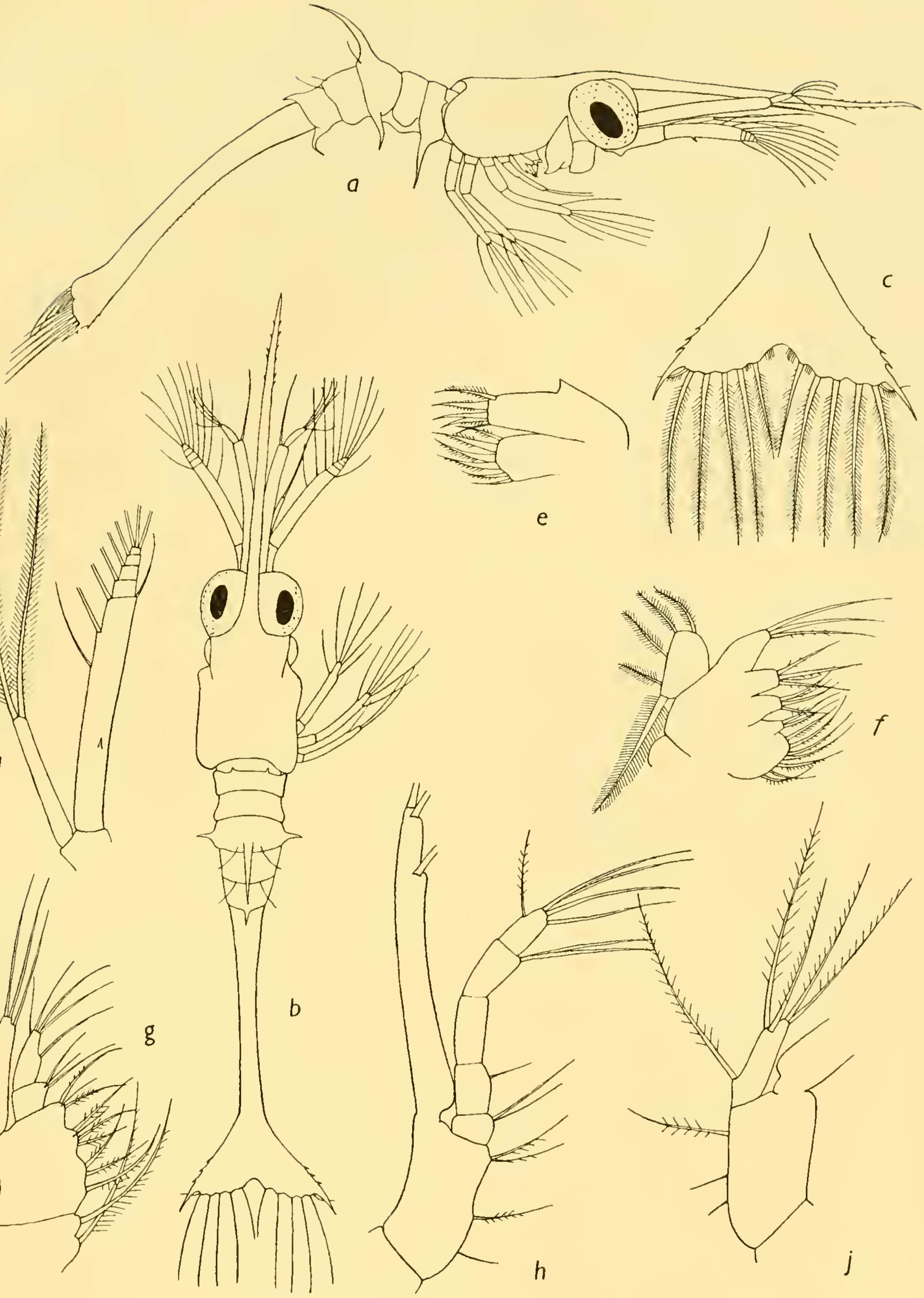

Fig. 1. *Stenopus hispidus* (Olivier). Stage I

a. Side view. *c*. Telson. *e*. Maxillule. *g*. Maxillipede 1. *j*. Leg 1.
b. Dorsal view. *d*. Antenna. *f*. Maxilla. *h*. Maxillipede 2.

Antennule with peduncle unsegmented. Antennal scale showing four distinct terminal segments, with one outer seta and nine inner and apical; endopod nearly half length of scale, with two long apical setae.

Mandible very large, without palp. Maxillule with vestigial palp. Maxilla with four inner lobes; endopod simple, with three setae; exopod with five setae. Maxillipede 1, endopod of two segments; exopod with four setae. Maxillipedes 2 and 3, endopod long and slender, of five segments; exopod with six setae. Leg 1, exopod with six setae; endopod small, unsegmented, with long setae. No other legs represented.

Table I. *List of stations at which Stenopid larvae were taken*

Station	Position	Depth (metres)	Larvae
407	35° 05′ S, 17° 49′ E	150–0	*S. hispidus*, 1
413	33° 13′ S, 15° 46′ E	350–0	*Stenopus* II, 1
690	3° 18′ S, 30° 00′ W	460–0	*S. hispidus*, 8
701	14° 39′ N, 25° 51′ W	242–0	*Stenopus* III, 1
705	0° 03′ N, 30° 36′ W	50–0	*S. hispidus*, 1
706	3° 26′ S, 32° 08′ W	231–0	*S. hispidus*, 1
709	14° 01′ S, 36° 30′ W	216–0	*S. hispidus*, 2
			Stenopid I, 1
710	21° 45′ S, 39° 50′ W	294–0	*Stenopus* II, 1
711	24° 40′ S, 41° 30′ W	230–0	Stenopid VI, 1
1374	31° 46′ S, 29° 46′ E	230–0	*S. hispidus*, 1
1375	34° 30′ S, 26° 19′ E	210–0	*S. hispidus*, 1
1574	21° 44′ S, 40° 33′ E	1100–450	*S. hispidus*, 1
1575	18° 33′ S, 41° 35′ E	400–0	*S. hispidus*, 1
			Stenopid I, 1
		800–560	Stenopid II, 1
1576	14° 42′ S, 42° 22′ E	400–0	*S. hispidus*, 2
			Stenopid V, 1
1578	11° 25′ S, 42° 03′ E	500–0	*S. hispidus*, 1
		1000–550	Stenopid I, 1
1580	8° 44′ S, 41° 50′ E	450–0	*S. hispidus*, 1
			Stenopid III, 1
1581	7° 42′ S, 44° 14′ E	600–0	*S. hispidus*, 1
1586	2° 39′ N, 50° 46′ E	550–0	*S. hispidus*, 1
1587	6° 05′ N, 52° 00′ E	1250–800	*S. hispidus*, 1
'Atlantis' 1121	35° 53′ N, 62° 45′ W	400–0	*S. hispidus*, 5
			Stenopid I, 1
			Stenopid IV, 1

STAGE II (Gurney, 1924, fig. 54 B). Length 5·45 mm., including rostrum 2·05 mm. Differs only in having stalked eyes, and large supra-orbital spines. The endopod of the antennule appears, and the telson has 8 + 8 spines. Leg 2 a small rudiment.

Further stages of *S. hispidus* are not known with certainty, but the Discovery material contains a number of late stages which may be assigned to this species with some confidence.

Misled in my own account of 1924 by wrong identification of the first larva, I have suggested that Cano's first stage of *S. spinosus* may be stage II, but it is no doubt

stage I, and his second larva represents stage III, in which the uropods appear. The development of *Stenopus* thus conforms to the normal sequence with the exception of the early appearance of leg 1.

The next known stage attributed to *S. hispidus* (Gurney, 1924, p. 136) is probably stage V, and has a total length of 14·8 mm. (rostrum 4 mm.). This stage is that shown in Fig. 2. The first three pairs of legs are developed, with setigerous exopods, but with very small endopods, borne low down on the basis. Legs 4 and 5 are minute uniramous rudiments. Pleopods absent, but uropods large, with numerous setae.

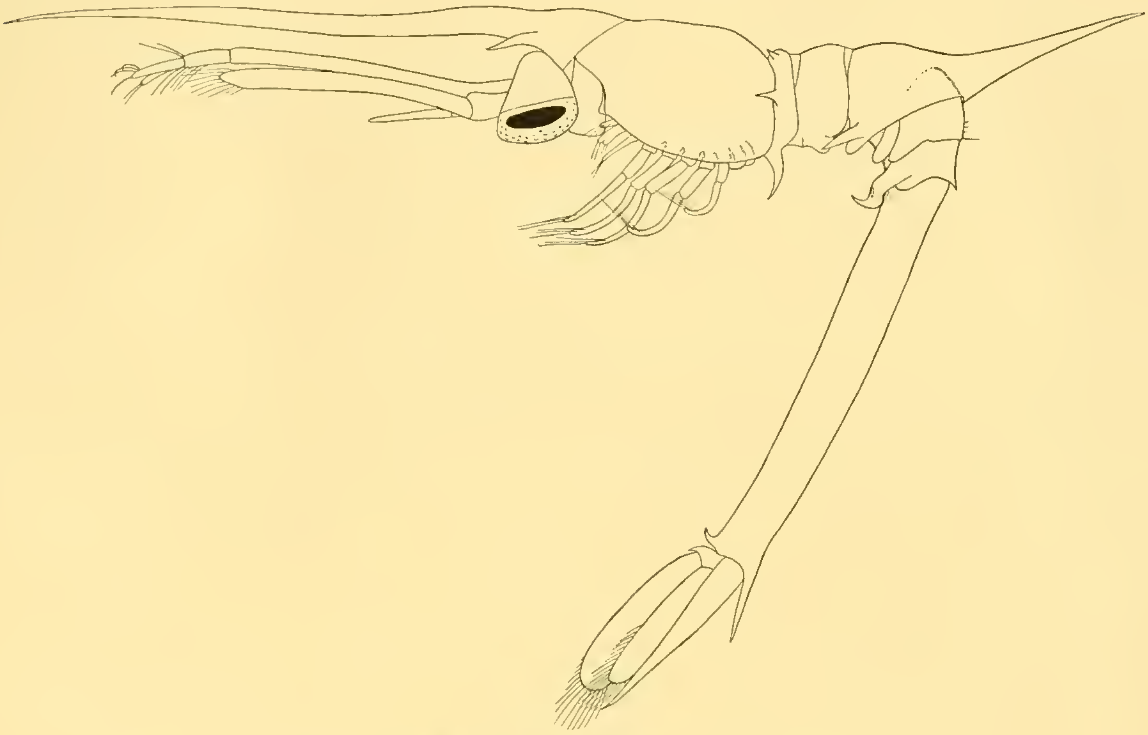

Fig. 2. *Stenopus hispidus* (Olivier), 15 mm. St. 705

STAGE VI?. Length 17–18·6 mm.

This stage differs only in the appearance of pleopods and the greater development of limbs.

Beyond this size it is probably impossible to define stages, as it appears that development goes on for a long time with increase of size but very little change in structure. The largest specimens seen were taken by the 'Atlantis'.

STAGE IX? (Fig. 3 *a–g*). Length: rostrum 8·8 mm.; thorax 5·0 mm.; abdomen 17·5 mm.: total 31·5 mm.

General form of body and spines the same. Telson long and narrow, with a pair of terminal spines and setae between. Antennule, peduncle of three segments; rami about three times as long as segment 3. Antenna, endopod longer than scale, without setae.

Mouth-parts very little changed. Maxillipede 1 with very large epipod; exopod with eight setae; endopod of three segments. Maxillipede 2 with epipod; exopod with

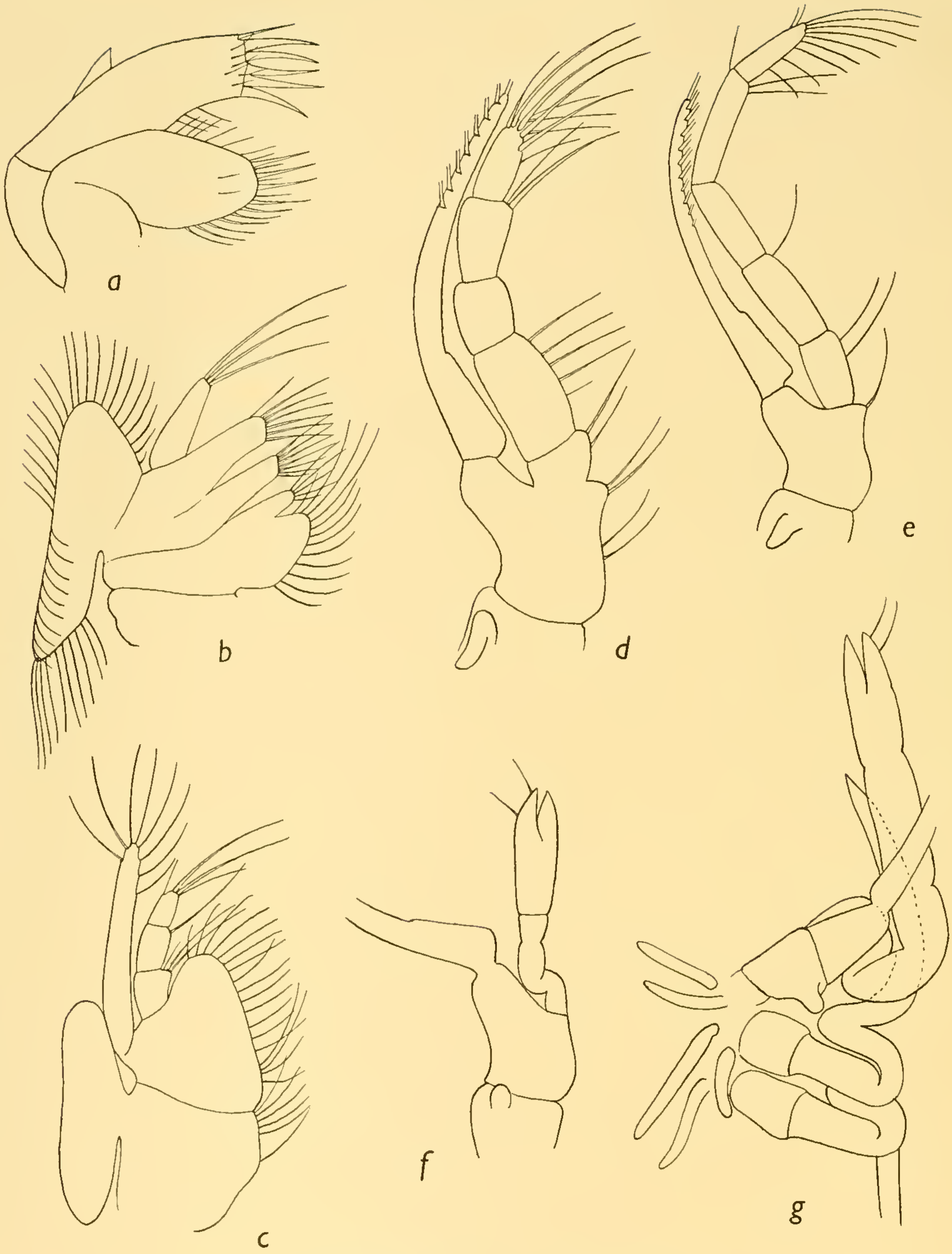

Fig. 3. *Stenopus hispidus* (Olivier), 30 mm.

a. Maxillule.
b. Maxilla.
c. Maxillipede 1.
d. Maxillipede 2.
e. Maxillipede 3.
f. Leg 1.
g. Legs 3–5.

sixteen setae. Maxillipede 3, exopod with twenty-two setae. Legs 1–3, exopods with numerous setae; endopods large, chelate, twisted. Legs 4 and 5 long, twisted, unsegmented and unbranched. Pleopods large, without setae, on somites 2–5.

The gills, which are not well developed, are arranged as follows:

		Gills
Maxillipede 1	Ep.	–
,, 2	Ep.	–
,, 3	Ep.	2
Legs 1–3	Ep.	2
Leg 4	—	2
Leg 5	—	1

The pairs of gills seem to represent one pleurobranch and one arthrobranch. The formula does not correspond at all closely with that of the adult, but it is not inconsistent with it. It is quite commonly the case that the arthrobranchs appear later than the pleurobranchs.

OTHER STENOPID LARVAE

It is obviously impossible to determine at present which of the very marked characters which distinguish the different larvae are generic and which specific, but I assume provisionally that the median hooked process of abdominal somite 5, which is known to be a character of *S. hispidus* and *S. spinosus*, is confined to the genus *Stenopus*. I have, then, two more larvae to refer to this genus.

Stenopus species II (Fig. 4)

Sts. 413, 710

STAGE I (Gurney, 1924, p. 134, fig. 54 A). Length 3·1 mm., including rostrum 0·8 mm.

Rostrum very long, smooth, extending beyond antennules. Carapace without supra-orbital spines, produced behind at posterior angle into a small spine.

Abdominal somites 1, 3, 4 with pleural spines. Somite 5 with procurved median ventral process. No dorsal spines. Telson and appendages as in *S. hispidus*.

STAGE VI ?. Length 13·3 mm., including rostrum 4·1 mm.

Carapace with very large supra-orbital spines, and large spines at posterior angles.

Abdominal somite 1 with recurved pleural spines and dorso-lateral processes. Somite 3 without dorsal spine, and with small pleural spines. Somite 4 with small pleural spines. Somite 5 with median ventral hooked process. Somite 6 very long, with terminal dorsal spine and a small ventral pair of spines. Telson elongated, with a pair of terminal spines and four long setae between. Uropods large, with numerous setae; exopod with outer apical spine.

Antenna, endopod about half length of scale. Legs 1–3 with functional exopods; endopods very small. Legs 4 and 5 very small rudiments. Pleopods absent.

Stage VIII ?. Length 10·6 mm. (rostrum broken off).

This stage differs from the preceding in the greater development of the legs, of which legs 1–3 are chelate, and in having biramous pleopods.

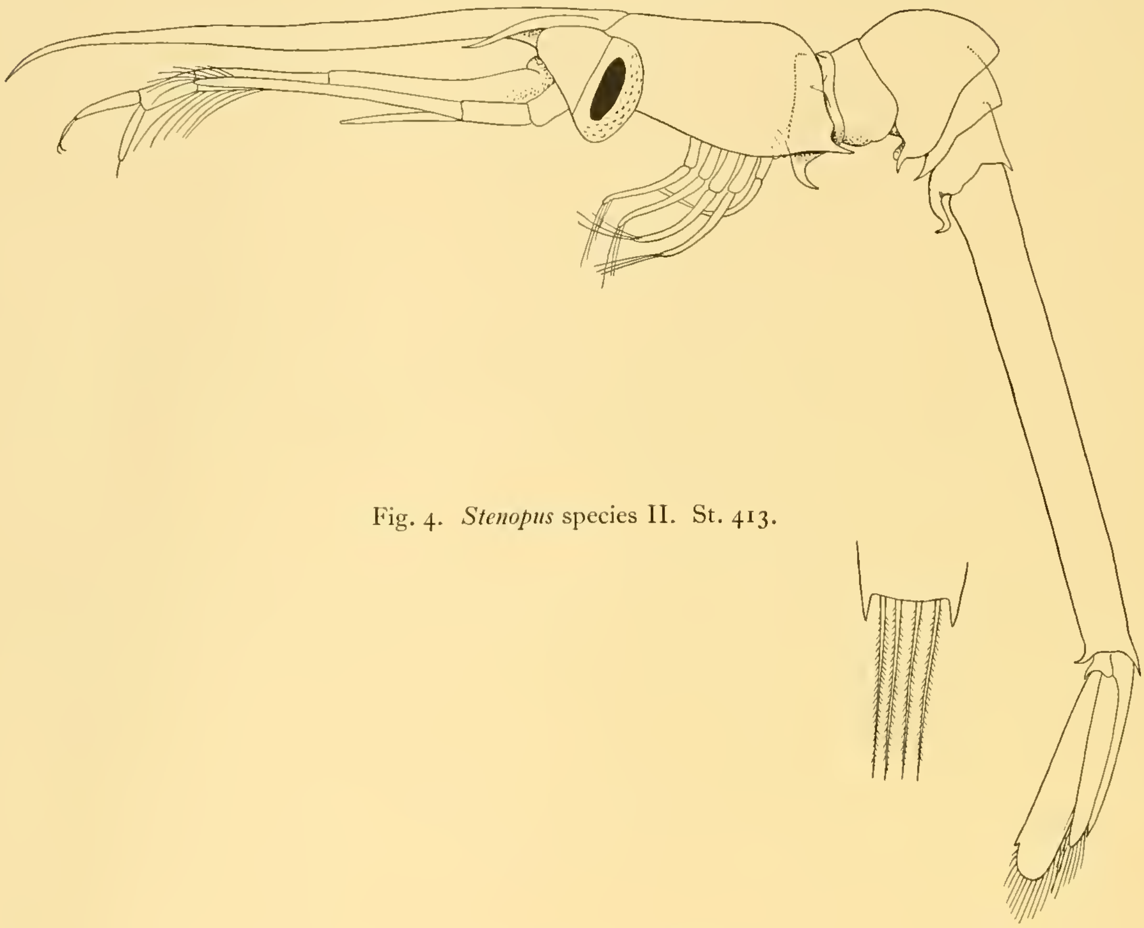

Fig. 4. *Stenopus* species II. St. 413.

Stenopus species III (Fig. 5)

St. 701

Length 15 mm., including rostrum 5·3 mm.

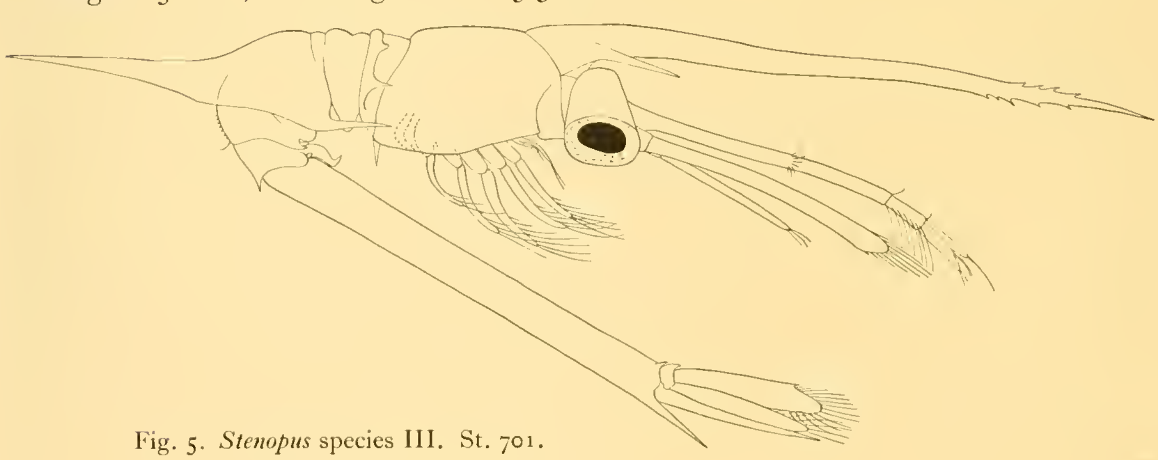

Fig. 5. *Stenopus* species III. St. 701.

This species differs from *S. hispidus* as follows:

(1) The rostrum bears a series of small teeth towards the end.

(2) Supra-orbital spine longer and straighter.

(3) Pleural spine of abdominal somite 3 very long and straight, overlapping the carapace.

(4) Somite 4 with very small pleural spines.

(5) Pleural spine of somite 6 very small.

The remaining six forms cannot be separated into generic groups. It is quite possible that all may belong to the genus *Spongicola*, but the best course seems to be to describe them simply as problematical members of the family Stenopidae.

Stenopid I (Fig. 6)

Sts. 709, 1575, 1578; 'Atlantis' St. 1121.

STAGE V?. Length 5·7 mm., including rostrum 0·45 mm.

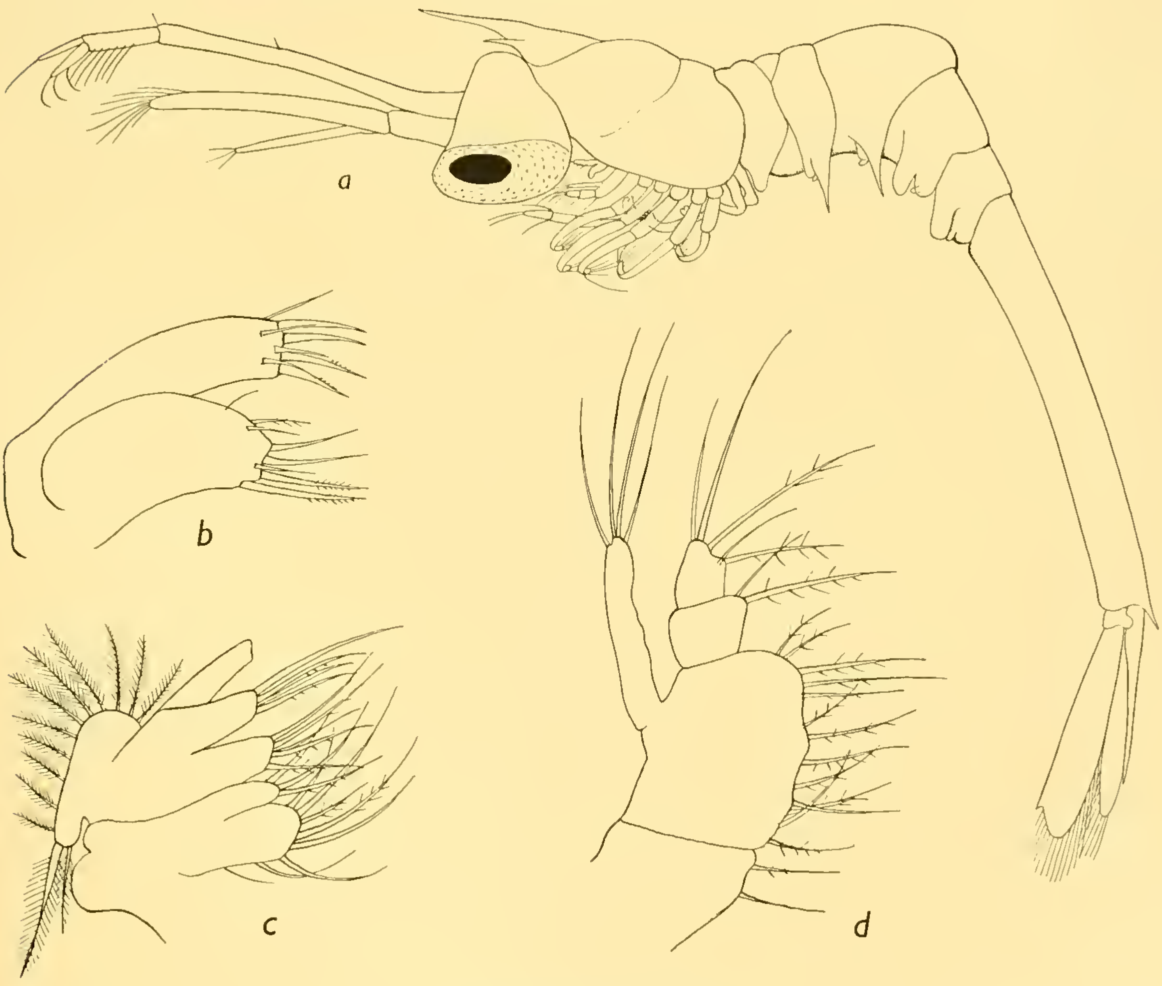

Fig. 6. *Stenopid* I. St 709.

a. Side view. *b*. Maxillule. *c*. Maxilla (setae of endopod broken off). *d*. Maxillipede 1.

Rostrum very short, extending only to end of peduncle of antenna. Supra-orbital spines large; carapace rounded behind. Abdominal somites 1–5 without dorsal spines; somites 1, 4, 5 with pleura rounded, somites 2 and 3 with long pleural spine on either side. Somite 6 with small terminal dorsal spine, but no lateral or anal spines. Telson narrow, shorter than uropods, with pair of small apical spines and six setae between.

Endopod of antenna about two-thirds length of scale. Maxillule without trace of palp. Maxillipede 1 endopod and exopod very small, the former of two segments only. Legs 1–3 with endopods chelate. Legs 4 and 5 rudimentary. Pleopods absent. Uropods large, with many setae.

An older specimen of 7·8 mm. differs only in having the endopod of the antenna longer, and in the presence of pleopods.

Two specimens from Sts. 1575 and 1578 agree so nearly with those from the Atlantic that they may be assumed to belong to the same species. In one of them the pleura of abdominal somite 1 were pointed, a difference which may perhaps be specific.

Stenopid II (Fig. 7)

St. 1575

Stage VI ?. Length 12·2 mm. (rostrum 2·1 mm.).

Rostrum not reaching end of peduncle of antennule, smooth. Supra-orbital spines small; carapace rounded behind. Abdominal somites 1–5 without dorsal spines, but each with a small procurved pleural spine. Somite 6 with small dorsal, but no lateral or anal spines.

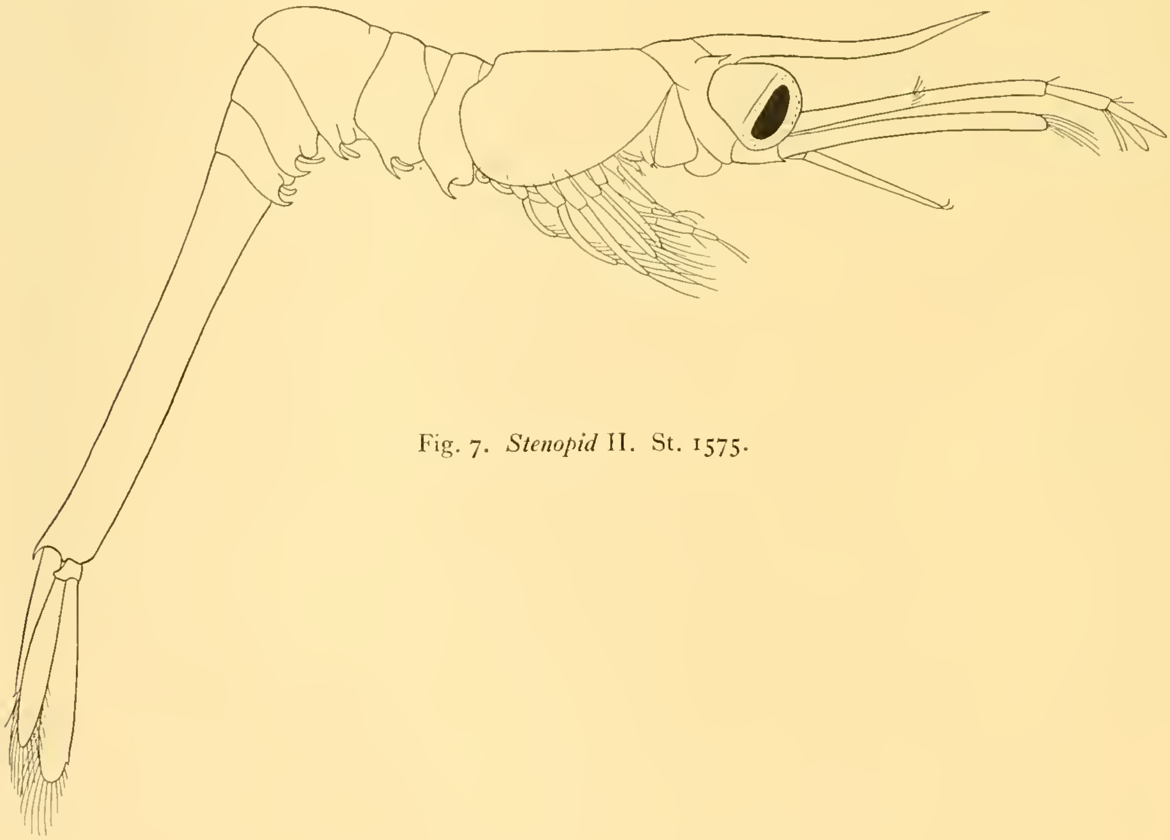

Fig. 7. *Stenopid* II. St. 1575.

Stenopid III (Fig. 8)

St. 1580

STAGE VII ?. Length 12 mm. (rostrum 3·4 mm.).

Rostrum extending beyond antennule, smooth. Carapace without supra-orbital spines, rounded behind. Abdominal somite 3 with large dorsal spine; somites 1–5 with large pleural spines, that of somite 1 directed backwards, the others forwards. Somite 6 with dorsal, but no lateral or anal spines.

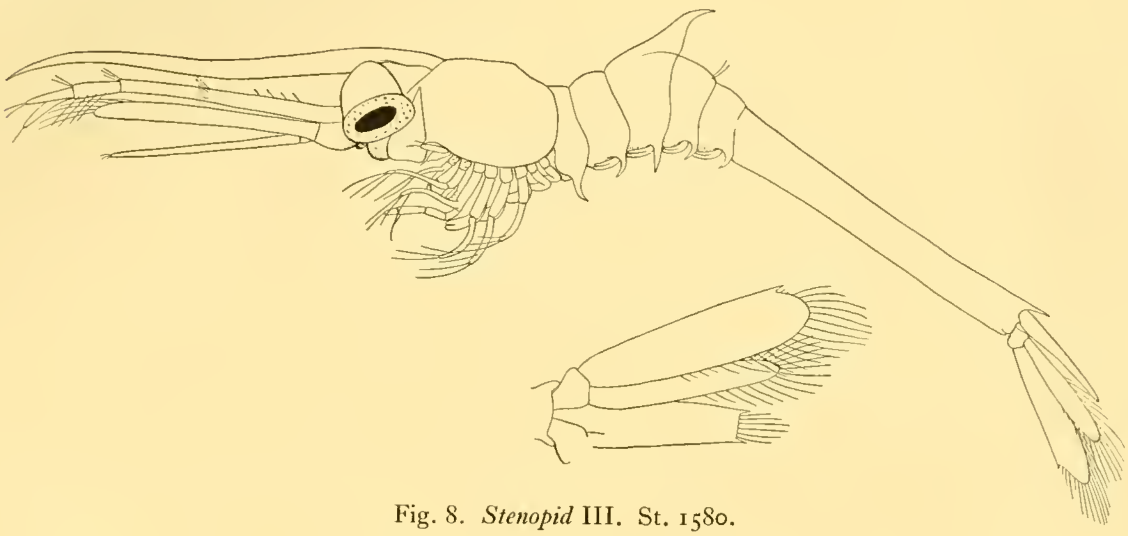

Fig. 8. *Stenopid* III. St. 1580.

Stenopid IV (Fig. 9)

'Atlantis' St. 1121

STAGE IX ?. Length 11·6 mm. (rostrum 2 mm.).

Rostrum extending just beyond peduncle of antennule. Supra-orbital spine minute. Carapace deeply grooved in front and behind, rounded behind. Abdominal somite 3 with large dorsal spine. Somites 1–5 with pleural spines, those of somite 1 very large, and all pointing slightly forwards. Somites 5 and 6 with small dorsal spine, the latter without lateral spine. Legs 1–3 chelate, very large.

This is no doubt the last larval stage, and contrasts very much in size with the equivalent stage in *S. hispidus*.

Stenopid V (Fig. 10)

St. 1576

STAGE VI ?. Length 16 mm. (rostrum 5·3 mm.).

Rostrum longer than antennules, smooth. Supra-orbital spines very small; carapace with strong spine at posterior angle. Abdominal somites 1–5 with pleural spines, directed backwards on somite 1 and forwards on the others; somites 3, 5, 6 with dorsal spines, the former large. Somite 6 without pleural or anal spines.

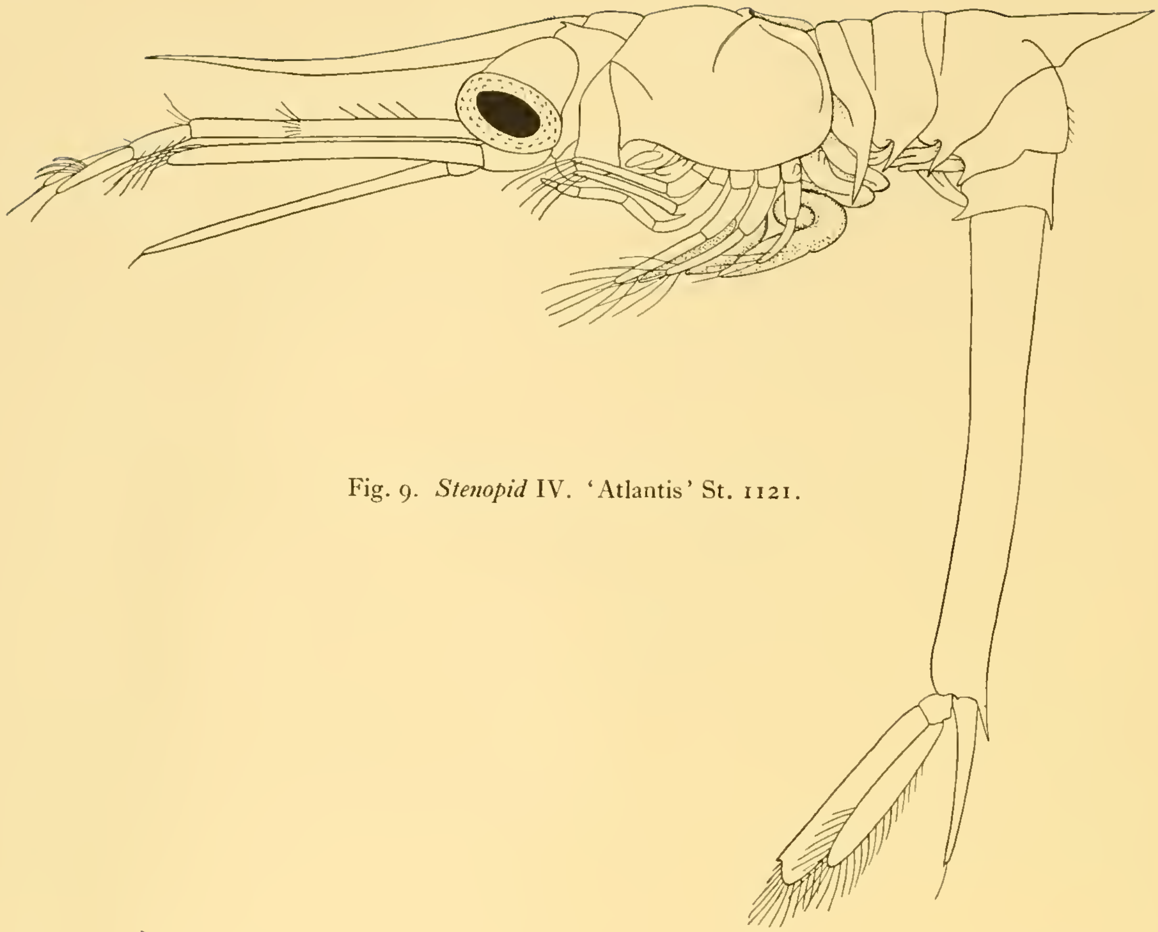

Fig. 9. *Stenopid* IV. 'Atlantis' St. 1121.

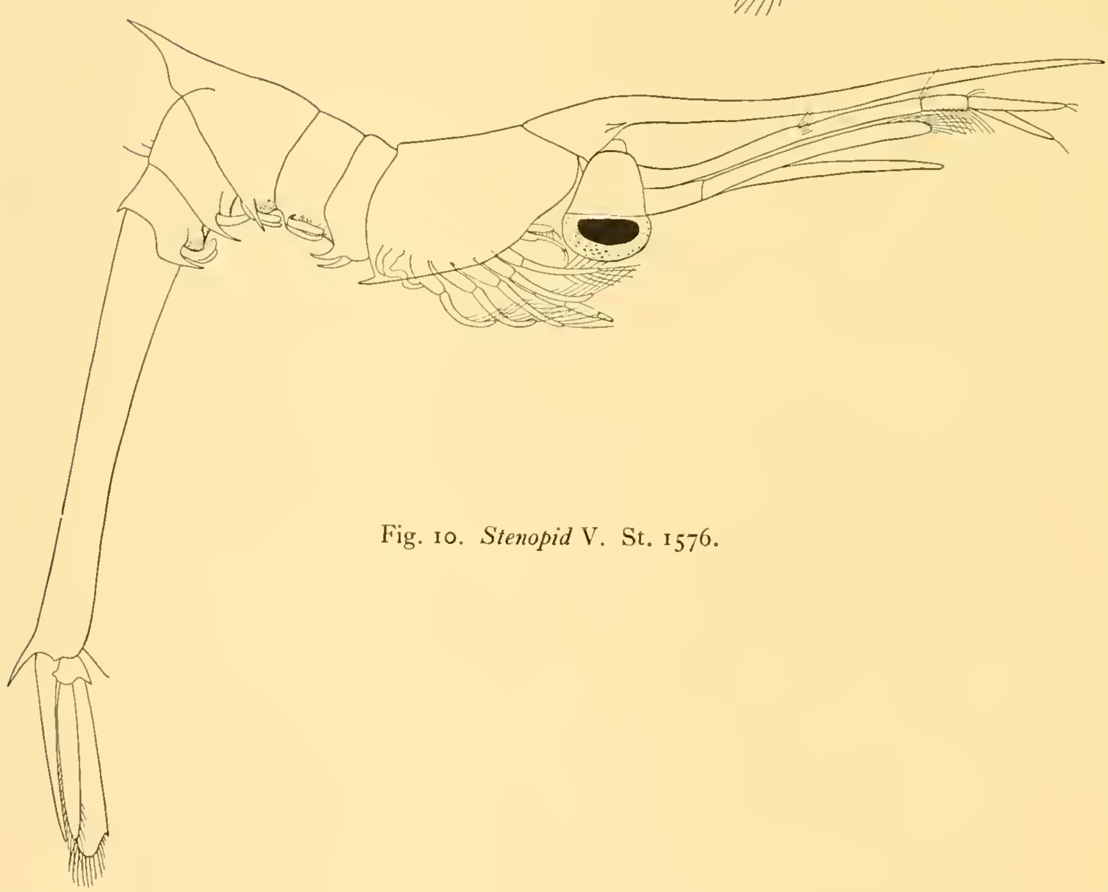

Fig. 10. *Stenopid* V. St. 1576.

Stenopid VI (Fig. 11)

St. 711

STAGE V?. Length 13·35 mm. (rostrum 4·7 mm.).

Rostrum much longer than antennule, smooth. Supra-orbital spines large; carapace rounded behind. Abdominal somites 1–3 with large forwardly directed pleural spines, that of somite 1 peculiarly large; somites 4 and 5 without pleural spines. Somite 3 produced into an enormous dorsal spine. Somites 5 and 6 with dorsal spines, the latter without lateral or anal spines.

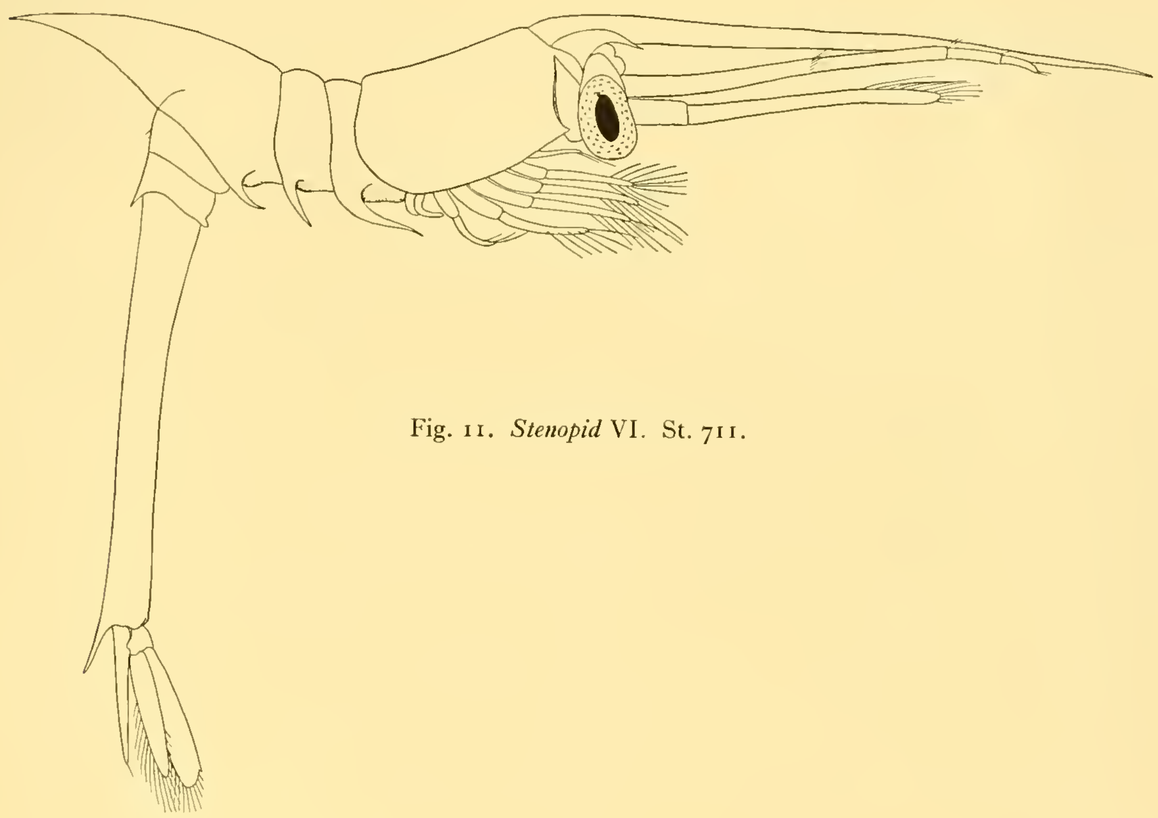

Fig. 11. *Stenopid* VI. St. 711.

KEY TO THE FORMS OF STENOPID LARVAE HERE DESCRIBED

a. Median ventral hook on abdominal somite 5.
  b. Abdominal somite 3 without dorsal spine ... ... *Stenopus* sp. II.
  bb. Abdominal somite 3 with dorsal spine.
    c. Rostrum smooth, or with minute spinules ... ... *Stenopus hispidus.*
    cc. Rostrum with small teeth near end ... ... *Stenopus* sp. III.

aa. No median ventral hook on abdominal somite 5.
  b. Abdominal somite 3 without dorsal spine.
    c. Rostrum very short; abdominal somites 1, 4, 5 without pleural spines STENOPID I.
    cc. Rostrum long; pleural spines on all somites ... ... STENOPID II.

bb. Abdominal somite 3 with dorsal spine.
  c. Carapace rounded posteriorly.
    d. Rostrum shorter than peduncle of antennule ... ... STENOPID IV.
    dd. Rostrum longer than antennule.
      e. Pleural spines on all abdominal somites ... ... STENOPID III.
      ee. Somites 4 and 5 without pleural spines ... ... STENOPID VI.
  cc. Carapace with posterior spine ... ... STENOPID V.

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PART II. AMPHIONIDAE

The genus *Amphion* was founded by H. Milne Edwards in 1832 on a specimen taken in the Indian Ocean, and he included it in 1837, together with *Phyllosoma*, in his "Stomapodes bicuirassées", on the assumption that it was a mature form. Dohrn (1870) also accepted it as an adult genus, but Claus (1876) insisted on its larval nature and concluded that it was most nearly related to Sergestidae. He studied a series of stages, the earliest of which appears to have been stage III, but he did not have the oldest stage with leg 5 developed. About the same time appeared a letter from Willemoes-Suhm from the 'Challenger' (December 1875) in which he claimed to be able to distinguish males and females, and Claus, in a postscript, was forced to accept the possibility that *Amphion* may become mature without much change of form, in which case it would represent "eine interessante Schizopoden-Form, deren Maxillen und vorderen Kieferfüsse zu den Decapoden hinführen und deren Rückenschilde bereits mit sämmtlichen Thoracalringen verwachsen ist" (p. 112). Boas (1879, 1880) discussed the genus and concluded that it was a larval form related to *Phyllosoma*. He suggested that it was the larva of *Polycheles*. Spence Bate (1888), with a comparatively rich material, described a number of stages and distinguished two species, but found none which could "with certainty be pronounced to be adult". He thought, however, that the adult would not differ much from the oldest larva described, in which leg 5 was a large uniramous rudiment. He included it, with *Procletes*, *Icotopus*, *Hectarthropus* and *Eretmocaris*, all larval genera, in a tribe Haplopoda and family Hectarthropidae.

Korschelt and Heider (1893, p. 461) regarded *Amphion* as the larva of a carid, owing to its possession of phyllobranchs. Ortmann (1893, p. 90) added nothing to our knowledge of the genus, but rejected Bate's species *A. provocatoris*. Koeppel (1902) attempted a thorough revision of the genus, but with inadequate material (nine specimens) and unfortunate results. He claimed to have found "brood lamellae" at the base of

maxillipede 3 and legs 1–5, and stated that pleopod 1 is absent and that leg 5 is biramous. His conclusion that the oldest individuals are mature and related to Sergestidae was quite unjustified.

Sund's proof (1915) that *Eryoneicus* is the larva of *Polycheles* disposes of Boas' suggestion, and the real position of *Amphion* remains as uncertain as ever it was.

I have suggested myself (1924, p. 105) that Korschelt and Heider were right in referring *Amphion* to the Caridea. That the oldest known specimens are immature there can be no doubt. The form of all the appendages is definitely larval, and even if the presence of a gonad can be demonstrated, that does not necessarily imply maturity. It is known that certain carid larvae of the high seas continue to grow and retain larval characters until the sexes are recognizable by the form of pleopod 2, and it is probable that the same is the case with *Amphion*. If *Amphion* is a carid, as its gills and mouth-parts so strongly suggest, the only known genus to which it can possibly be attached is *Amphionides*, Zimmer, of which a description is given below.

Amphion

The Discovery material contains about a hundred specimens of *Amphion*, mainly of the later stages. The smallest specimen, in which the three pairs of maxillipedes only are developed, and without uropods, represents the earliest stage described (Bate, 1888, pl. 146, fig. 1), but it appears from the condition of the eyes and antennae, and the presence of rudiments of the uropods under the cuticle, to be actually stage II (Fig. 12*a*). The next stage, of which there are two specimens only, agrees with the normal stage III of Caridea in having uropods with the endopod not fully developed. Among the older specimens it is possible to distinguish six stages, making nine in all, but these stages are not well defined and it is not possible to fit every individual into a clear-cut group. For instance, in two specimens in which the legs may be at the same stage of development, the antennules may be much more developed in one than in the other, and the appearance and size of the pleopods does not always correspond in specimens judged on other grounds to be in the same stage. Assuming a growth factor of about 1·26 the range of size between the smallest and largest specimens may be divided into eight stages corresponding very closely with the average sizes observed, so that I feel confident that a total of nine stages, or eight moults, is correct, even though there may be great variation in the degree of development attained by individuals at each moult.

The rudiment of leg 5 may be quite distinct in specimens smaller, and apparently younger, than others in which it is not present at all; and it may still be absent in specimens as large as 23 mm. There are only about fifteen specimens old enough for these details to be made out, and of these five only have no trace of leg 5. In these five pleopod 1 has no endopod, whereas it is distinctly biramous in all the others. It seems possible that the differences in these two characters may be indicative of sex, those without leg 5 being males.

Both Bate and Suhm believed that they could recognize a testis, and Koeppel described an ovary, but the testis of Bate and the ovary of Koeppel were probably really

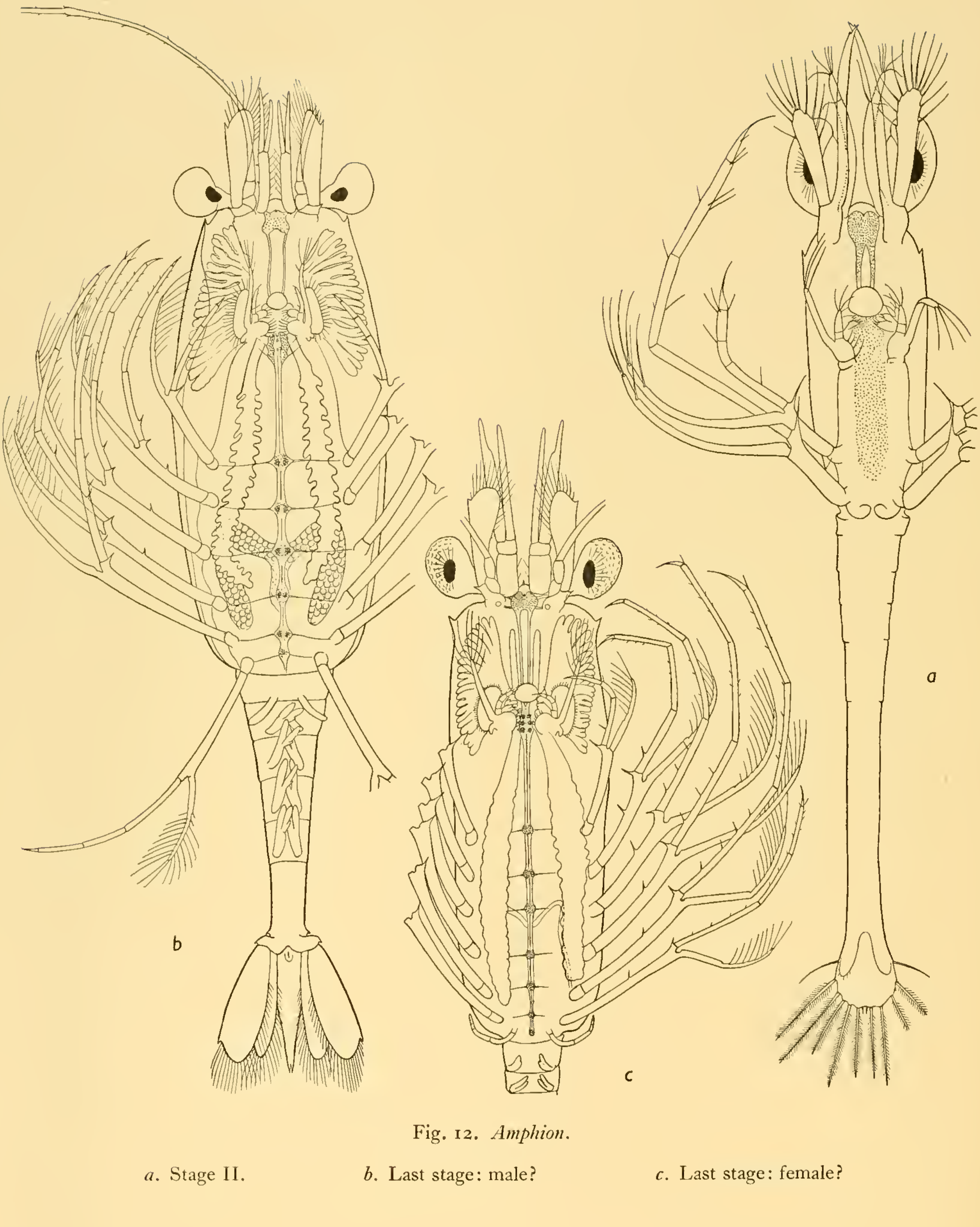

Fig. 12. *Amphion*.

a. Stage II. *b*. Last stage: male? *c*. Last stage: female?

the posterior diverticula of the stomach. Suhm's "testis" is a structure easily seen in most of the older specimens. It runs across the front of the heart, and is generally filled with granular matter, or occasionally with large cells having the appearance of ova. On each side it turns sharply backwards and can be traced as a slender strand to the region of leg 5. In one case I have seen these strands leading apparently to leg 3, and in this case the cells of the organ were larger than usual. The organ has the appearance of a developing gonad, but it is unaccountable that it should so generally run to leg 5, for it is unlikely that so large a percentage of the specimens should be males. Whatever the nature of this organ is, it is of no very great importance, since *Amphion* is most certainly not a mature animal, even though it may be proved to have a developing gonad.

Distribution.

The Discovery material of *Amphion* consists of ninety-seven specimens, most of which were taken at twenty-six stations in the Atlantic along the meridian of 30° W from 30° S to nearly 33° N. Other stations are in the region of the Canaries and in the equatorial region. In addition there was an isolated capture at St. 85, west of the Cape in about 5° E long., and six along the east coast of Africa. The localities are given in Table II.

All appear to belong to a single species. In nearly all cases a minute rostral spine is present, and also a procurved post-rostral spine which is the termination of a slight dorsal ridge. Bate distinguished the Atlantic from the Pacific form as follows:

Rostral spine present, but no post-rostral	*A. reynaudi*, M.-Edw., Pacific.
Rostral spine absent; post-rostral present	*A. provocatoris*, Bate, Atlantic.

Ortmann (1893) has already pointed out that both spines are present in the Atlantic form, and he therefore rejected Bate's species. In the Discovery material the rostral spine is sometimes absent, but the post-rostral is always present, except in very young specimens when it is represented by a simple protuberance in both Atlantic and eastern specimens.

The vertical distribution cannot be determined from the Discovery samples, since the net was fished open to the surface. Taking the maximum depths of the hauls in which *Amphion* was captured the distribution was as follows:

Depth (metres)	Number of specimens	Number of hauls	Number per haul
0–200	7	3	2·3
200–400	49	14	3·5
400–600	32	11	3·0
600–800	—	—	—
800	9	4	2·25
Total	97	32	

These figures do not prove anything, but suggest that *Amphion* may be more common between 200 and 500 m. There is no indication that the larger individuals were taken in the deeper waters.

Table II. *List of stations at which* Amphion *was taken*

Station	Position	Depth (metres)	Number of specimens
—	29° 27′ N, 15° 07′ W	900–0	3
—	33° 27′ N, 14° 39′ W	Surface	1
85	33° 07′ S, 4° 30′ E	2000–0	1
287	2° 49′ S, 9° 25′ W	800–1000	1
288	0° 56′ S, 14° 08′ W	250–0	2
295	5° 30′ N, 17° 45′ W	2500–2700(–0)	4
437	29° 59′ S, 31° 47′ E	123–0	3
677	31° 16′ S, 29° 56′ W	420–0	4
679	26° 06′ S, 30° 06′ W	300–0	7
680	22° 36′ S, 30° 01′ W	260–0	1
682	20° 11′ S, 29° 57′ W	375–0	1
688	9° 26′ S, 29° 50′ W	450–0	3
689	5° 59′ S, 29° 49′ W	410–0	4
690	3° 18′ S, 30° 00′ W	460–0	2
691	0° 25′ S, 29° 56′ W	400–0	2
692	2° 02′ N, 30° 08′ W	350–0	4
694	4° 05′ N, 30° 00′ W	210–0	1
695	7° 28′ W, 30° 00′ W	370–0	5
697	9° 15′ N, 30° 01′ W	460–0	3
698	12° 21′ N, 30° 07′ W	470–0	8
701	14° 39′ N, 25° 51′ W	292–0	3
702	10° 59′ N, 27° 04′ W	236–0	11
703	7° 17′ N, 28° 02′ W	358–0	6
704	3° 38′ N, 29° 14′ W	231–0	2
706	3° 26′ S, 32° 08′ W	231–0	2
707	6° 44′ S, 33° 33′ W	182–0	3
708	10° 21′ S, 34° 55′ W	208–0	2
1571	27° 24′ S, 39° 21′ E	500–0	1
1574	21° 44′ S, 40° 33′ E	600–0	1
1581	7° 42′ S, 44° 14′ E	600–0	1
1585	0° 06′ S, 49° 45′ E	500–0	1
1586	2° 39′ N, 50° 46′ E	550–0	4

COLOUR AND SWIMMING HABIT.

I have had the opportunity of studying alive two specimens of *Amphion* taken in surface plankton at Bermuda. The body is almost colourless, but there are red chromatophores in the mouth region, at the base of the antenna, at the base of each leg and at the base of the telson. In one specimen there was also a chromatophore ventrally in abdominal somite 5. The eye may appear blue. The peculiar swollen part in the middle of the antennal flagellum was of a blackish orange colour.

One of these specimens lived for several days in a small bowl in the laboratory, but died during the moult to stage IX. It swam feebly in the usual position of the caridean larva, namely on its back with the tail foremost.

Amphionides valdiviae, Zimmer (Fig. 13)

Zimmer, 1904, Zool. Anz., xxviii, p. 226.

St. 295. 5° 30′ N, 17° 45′ W. Depth 2500–2700(–0 m.), 3 specimens. Length about 20 mm.

The thoracic region of these specimens is like a mass of torn and sodden tissue paper, in which it is impossible to discern any shape and most difficult to discover the arrangement of the appendages. I have attempted to construct a figure which will give some idea of this extraordinary decapod (Fig. 13 *a*), but the shape given to the thorax is largely conjectural.

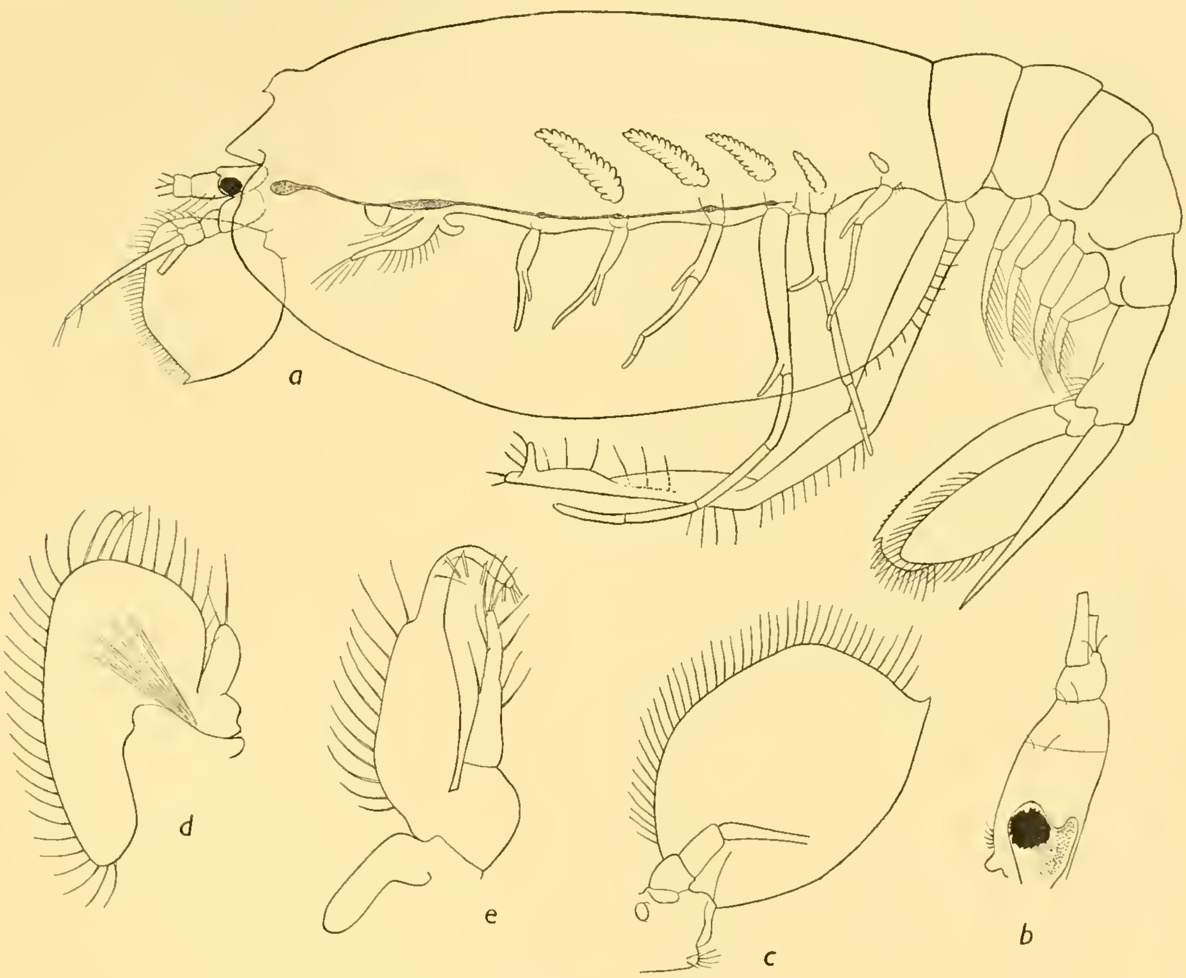

Fig. 13. *Amphionides valdiviae*, Zimmer.

a. Side view. *d*. Maxilla.
b. Eye and antennule. *e*. Maxillipede 1.
c. Antenna.

Zimmer expressed doubt as to whether the carapace was, in life, broad and flat or cylindrical; but I feel fairly sure that it was not flattened dorso-ventrally. Posterior margin fringed with hairs; anteriorly with a blunt rostral prominence and a faint median dorsal ridge ending in front in a wedge-like elevation with a small spine in front.

Abdomen solidly built, the somites without spines, and with small rounded pleura. Telson elongated, tapering to a point bearing a pair of minute spines. Eyes small, with black pigment and an inner papilla (Fig. 13*b*).

Peduncle of antennule very stout, three-segmented, without otocyst; outer flagellum about $1\frac{1}{2}$ times length of peduncle. Antenna (Fig. 13*c*) with very large oval scale, with small apical spine and a fringe of short setae on inner margin.

Mandible not seen. Maxillule vestigial, apparently represented by a pair of small papillae, without setae, on either side of upper lip. Maxilla (Fig. 13*d*) with very large setigerous exopod; endopod small, unsegmented; three vestigial inner laciniae without setae. Maxillipede 1 (Fig. 13*e*) with epipod and large exopod, the basal part of which is wide and fringed with setae on the outer margin; endopod two-segmented, slender; coxa and basis without setae.

Maxillipedes 2 and 3 and legs 1–4 with small exopods without setae; endopods slender, without setae. Leg 2 very long, but these and other appendages seem to be quite soft and functionless. Leg 5 absent.

Pleopod 1 is a delicate flattened structure, fringed with setae on either side and enormously long, reaching nearly to the mouth region. In each of the specimens it is more or less twisted and torn at the end, so that the real structure is difficult to make out. Pleopods 2–5 of normal form, with appendix interna. Uropods large, the outer branch serrated along the outer margin, and with apical spine.

Gills rather large on maxillipede 3 and legs 1 and 2, smaller on legs 3 and 4.

Zimmer, who does not say how many specimens he had ("ein Anzahl"), found one in which leg 5 was present as an unbranched appendage of six segments, and in which pleopod 1 did not differ from the rest except in being uniramous. He regarded this specimen as female and the rest as male.

THE SYSTEMATIC POSITION OF *AMPHION* AND *AMPHIONIDES*

The history of the genus *Amphion* has been summarized above and the suggestion has been made that *Amphionides* is its adult state. Zimmer treated *Amphionides* as a larva, but observed that it "erinnert ausserordentlich an die Gattung *Amphion*". It seems to me that he might have gone further, and have claimed it as an adolescent post-larval stage in the development of *Amphion*.

Amphionides is certainly a post-larval form, as shown by the structure of the eyes and all the appendages, and there is no real difficulty in assuming that it might develop directly from *Amphion*, great though the necessary changes are. The older specimens of *Amphion* commonly have the thoracic region swollen, and this swelling, which one would otherwise attribute to the preservative, may really be a step towards the inflated condition of *Amphionides*. Other details which suggest identity are the following:

(1) Form of exopod and presence of three laciniae only in maxilla.

(2) Agreement in form of post-rostral spine.

(3) Form of telson. The two small points at the apex in *Amphionides* correspond to the minute bifurcation in *Amphion*.

(4) In *Amphion* leg 5 is reduced and unbranched. In some specimens the leg is absent, and this may be a sexual difference as Zimmer claims it to be in *Amphionides*.

(5) In specimens of *Amphion* which lack leg 5 pleopod 1 is uniramous and rather long. This may also be a sexual difference foreshadowing the difference found in *Amphionides*. On the other hand Zimmer states that pleopod 1 is uniramous in both sexes of *Amphionides*, and it becomes necessary to assume that the rudimentary endopod found in female *Amphion* disappears later.

(6) According to Zimmer the digestive system is the same in both forms, and there is much similarity in the nervous system also, so far as it can be seen.

It is not claimed that this evidence amounts to any more than a justification for putting forward the proposition that *Amphion* and *Amphionides* may be one genus; but it is, at least, a possibility and, in my opinion, a probability. The fact that *Amphion* may be taken at Bermuda and kept alive for a considerable time raises the hope that the solution of this problem by direct observation is possible.

As to the systematic position of *Amphionides* Zimmer offered no suggestion in his preliminary account, and so far as I am aware he has not returned to the subject. Apart from the obvious conclusion that it belongs to the Caridea there does not seem to be much that one can say. It certainly cannot be referred to any known family of Caridea, and its most salient features, namely the reduction of the legs and the extraordinary development of pleopod 1, are unique, not only among Caridea but also in the Decapoda as a whole. *Amphion* and *Amphionides* must remain for the present as sole representatives of the caridean family Amphionidae.

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PART III. PHYLLOSOMA

For the purposes of this report I have examined and measured about 400 Phyllosomas from the Discovery collections, but it must be confessed that the results are disappointing. About a dozen different forms, generic or specific, have been recognized and are mentioned or described below, but it cannot be claimed that any real progress is made in identifying these forms, and even the question of the recognition of generic or specific characters is left uncertain. This uncertainty is mainly due to the incompleteness of the series of stages available. In no case are the earliest stages present, so that it is impossible to determine the number of stages passed through. This is a point of some importance, since the distribution of the adult must depend largely upon the duration of larval life and the direction and speed of the currents to which the larvae are exposed. The absence of these early stages may in part be explained by the season at which the samples were taken. According to Stephensen (1923) breeding of *Scyllarus arctus*, for example, is mainly confined to June and July, and this is probably true for other Loricata of the Mediterranean and Atlantic, but at Plymouth the Phyllosoma of *Palinurus vulgaris* may be taken from February to August (Lebour). Although a number of the Discovery samples in which Phyllosomas occur were taken at dates at which early stages could not be expected (e.g. St. 100, October 1926) there were occasions when they might well have been taken. For example, great numbers of Phyllosomas were caught near St Paul's Rocks in May 1931, when breeding must have been active, but the earliest stages of *Panulirus* present were 7–9 mm. in length which I have supposed to be in stage V. Stephensen's material of *Scyllarus arctus* from the Mediterranean is instructive in this connection, since he also seems to have had relatively few of the earliest stages, as shown in his table (p. 75) which may be summarized thus:

Stages	1	2	3	4	5	6	7	8
Specimens	2	8	23	59	87	112	88	24

On the other hand, at Plymouth, whereas stage I is quite commonly taken in the Eddystone area, later stages are relatively rare. It may well be that the earliest stages are passed through fairly rapidly in inshore waters, and that the 'Discovery', and also the 'Thor', were usually towing outside their range.

While the lack of these early stages deprives one of the means for estimating the duration of larval life, the absence of the last stage also in some cases makes identification impossible. This is peculiarly disappointing when the Phyllosoma presents features of special interest, as in the case of the form described as "*Thenus*?" This form, and also the one here called "*Parribacus*?", are here referred to the Scyllaridae for reasons which are given below, but such an identification I am most reluctant to accept, for the reason that both these forms seem much more closely to resemble the Palinuridae, and, if they are really Scyllaridae, there are two quite distinct types of scyllarid Phyllosoma. This would imply a separation of the Scyllaridae into two groups, a separation which cannot, so far as I know, be justified on adult structure.

A further difficulty in the study of these forms is the defective condition of the material. In the Discovery specimens the legs are lost from almost every specimen, and this, to judge from published figures, is the general rule. These legs do, in some cases, present striking features which would be useful systematically if available generally for comparison.

It is difficult to see how further progress can be made in systematic knowledge of Phyllosoma, since conclusive specific determination can only be got by capture of the last stage and observation of the moult to the natant stage. As the late Phyllosomas are high-sea forms, apparently confined to the deeper layers, and only accessible to well-equipped oceanographical expeditions, such observations cannot be expected. Such problems as this could be dealt with at the Bermuda Biological Station, where the deeps of the Atlantic are within so short a distance of an excellent laboratory, but the station at present has neither boat nor gear designed for oceanographical work.

Genus Palinurus, Fabricius

The development of *Palinurus vulgaris* has been described by Bouvier (1913) and by Santucci (1925*a*), both of whom found nine stages; but the accounts given of these stages are so incomplete and there are so many contradictions in the two accounts that a thorough re-examination is desirable. It is certain that *P. vulgaris* is much larger when hatched than *Jasus*, for example, and the last Phyllosoma, which Bouvier observed to moult to the Puerulus, does not much exceed 20 mm., or only about half the size of some of the *Panulirus* larvae. It might be expected, therefore, that there would be fewer stages in its development. I have myself seen very few of the older stages of *P. vulgaris*, and have not found it possible to fit them into the definitions given by Bouvier and Santucci. There is some reason to suppose that there may be less than nine stages, marked by considerable changes at each moult.

Characters of the Phyllosoma of *Palinurus*.

Fore-body about as wide as long at all stages, and wider than hind-body. Hind-body not concave behind. Abdomen parallel-sided.

Peduncle of antennule with segment 2 about half length of segment 3. Antenna with spinous process on segment 1 of peduncle.

Maxillule with palp. Maxilla with exopod greatly expanded in later stages and fringed with setae. Maxillipede 2 at first without exopod, but with setose exopod in late stages. Maxillipede 3 with setose exopod from stage I. Legs 1 and 2 with dactylus prolonged into a very long spine. Leg 4 retarded in development, and never so large as leg 3. Leg 5 closely apposed to abdomen, without exopod.

Maxillipede 3 and legs with coxal spines.

Palinurus gilchristi, Stebbing (Fig. 14)

Three specimens scarcely distinguishable from corresponding stages of *P. vulgaris*, were taken at the following stations in the neighbourhood of the Cape:

St. 444. 34° 22′ S, 18° 20′ E. One, 6 mm.
St. 407. 35° 05′ S, 17° 49′ E. One, 22 mm.
St. 102. 35° 29′ S, 18° 33′ E. One, 23 mm.

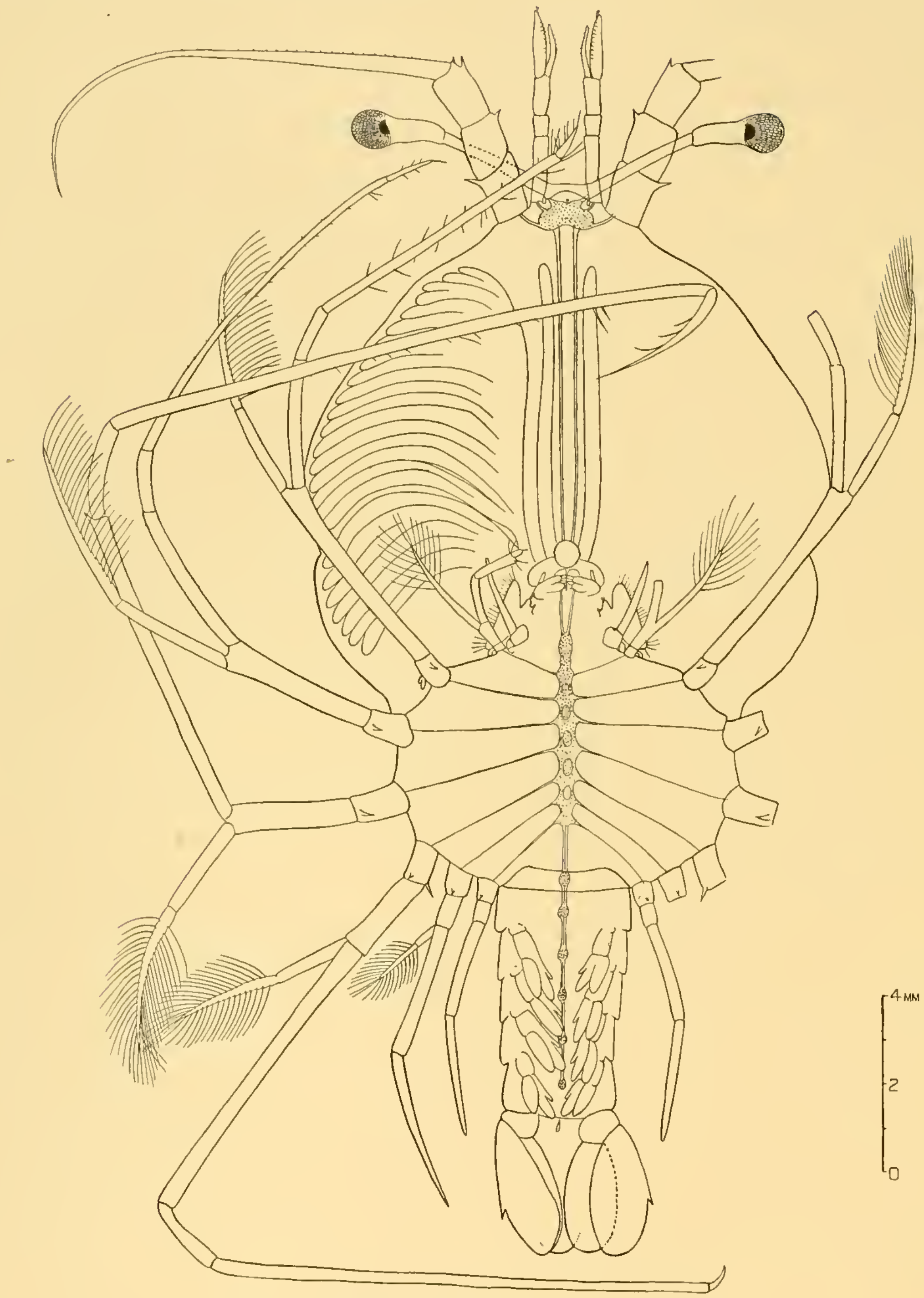


Fig. 14. *Palinurus gilchristi?*, 23 mm. St. 102.

These Phyllosomas may be referred with some certainty to *P. gilchristi*, which is found sparingly from the Cape eastwards to Natal (Von Bonde). Von Bonde (1932) has

described and figured a Phyllosoma of this species of 15·6 mm., in stage VIII, and a Puerulus of 18 mm. For convenience of comparison I give a figure of one of the Discovery specimens of 24 mm. in the last stage.

Palinurus sp. (Figs. 15, 16)

St. 1582. 5° 39′ S, 46° 22′ E. 1900–1850(–0) m. One specimen in last stage.

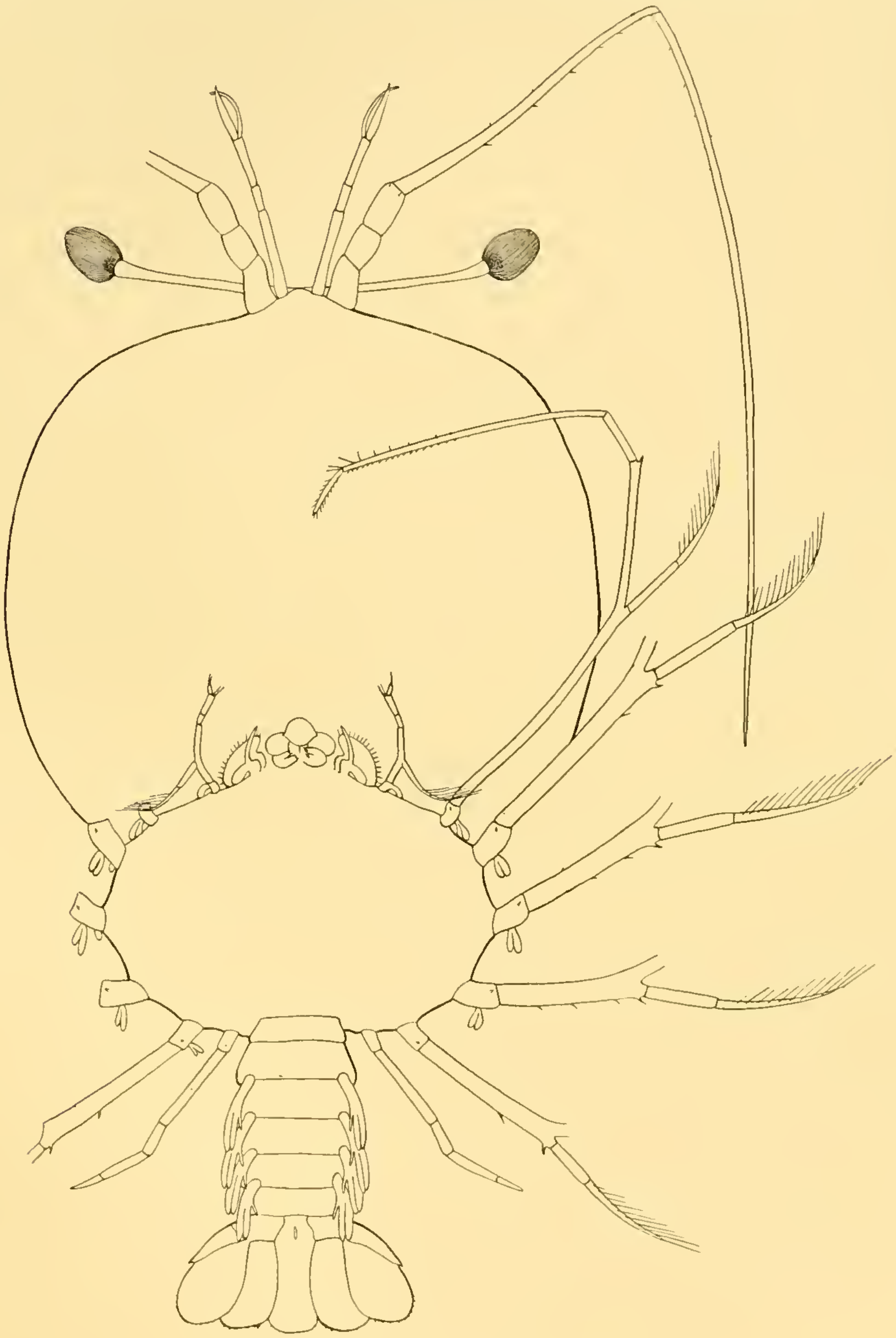


Fig. 15. *Palinurus* sp., 50 mm. St. 1582.

Length 50 mm. Pre-labral length 21 mm., width 28 mm. Post-labral length 29 mm., width 18 mm.

Fore-body a little wider than long, wider than hind-body. Hind-body much wider than long, not concave behind. Abdomen large, fully segmented; somite 6 with a pair of large dorsal spines at posterior angles, and a pair of small spines dorsally on posterior margin. Telson elongated, nearly parallel-sided, with a transverse row of four large spines showing under the skin about the middle of it. Posterior margin with small points.

Antennule with segment 2 of peduncle about half as long as segment 3; lengths of segments as 34:11:21. Peduncle of antenna stout, without outer spines; flagellum slender, 50 mm. long.

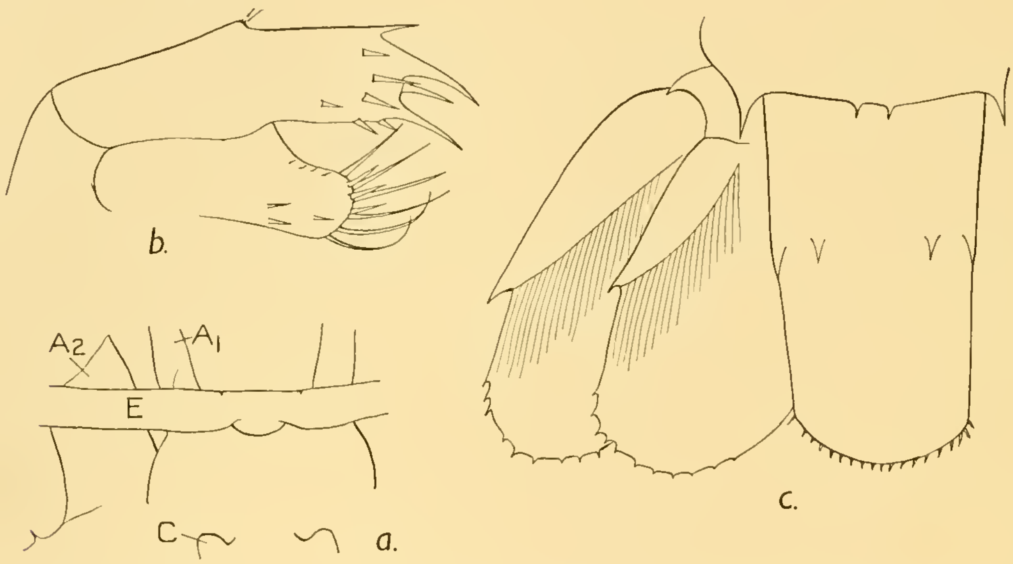


Fig. 16. *Palinuurs* sp., 50 mm.

a. Dorsal view of head region. A 1, antennule; A 2, antenna; C, cuticular elevation; E, eye-stalk. *b.* Maxillule. *c.* Telson and uropods.

Maxillule with only a vestige of the palp (Fig. 16*b*). Maxilla with large exopod fringed with setae. Maxillipede 1 large, with epipod. Maxillipedes 2 and 3 with long setose exopods. Maxillipede 3 and legs 1–4 with very small coxal spines. Leg 5 of five segments, without exopod. All gills present.

Pleopods large, with appendix interna free. Uropods large, with spine on outer margin of both branches, a basal muscular part distinct from a distal part which shows internal striation (Fig. 16*c*).

There can be very little doubt that this Phyllosoma belongs to a species of *Palinurus*, although it differs from *P. vulgaris* and *P. gilchristi* in not having a definite palp on the maxillule. On the other hand, it agrees with them in the proportional length of the segments of the antennular peduncle, which seems to be a very good generic character. The only species of the genus from this region is *P. longimanus* var. *mauritianus*, Miers. The great size of the Phyllosoma as compared with that of *P. vulgaris* is remarkable.

Four smaller specimens from the following stations may perhaps be earlier stages of the same species:

St. 407. 35° 05′ S, 17° 49′ E. Two, 16, 20 mm.
St. 444. 34° 22′ S, 18° 20′ E. One, 6 mm.
St. 1375. 34° 31′ S, 26° 19′ E. One, 11·4 mm.

These appear to belong to the genus *Palinurus*, but differ from the larva of *P. gilchristi* in having no distinct palp on the maxillule and in the presence of a group of three spines at the end of the basis of the legs.

Genus Panulirus, White

The first Phyllosoma of *Panulirus* is described by Nakazawa (1917, *P. japonicus*). It closely resembles *Palinurus vulgaris* but differs in the following respects:

(1) Antenna less than half length of antennule.
(2) Basis of legs, and particularly of leg 3, much shorter.
(3) Leg 3 very long, but exopod represented only by a very small projection.

The dactylus of leg 2 is produced as it is in *Palinurus*.

Crawford and Smidt (1923) give a rough figure of the first larva of *Panulirus argus*, which has a general similarity to that of Nakazawa, but apparently in this case the antenna is nearly as long as the antennule, and maxillipede 3 has no exopod. Later larvae have been referred to the genus by Bate (1888), Santucci (1927) and Von Bonde (1932). While there is no direct evidence for the identification of these later Phyllosomas there is no reason to doubt it, and we may assume provisionally the following characters for the genus:

Characters of the Phyllosoma of *Panulirus*.

Fore-body pear-shaped, sometimes very narrow. Hind-body wider, sometimes much wider, than fore-body; generally concave behind. Abdomen small and narrow in early stages.

Antenna slender. Maxillipedes 2 and 3 with exopod in later stages. Leg 5 without exopod.

The Discovery material contains a large number (about 200) of specimens of *Panulirus* Phyllosomas which can be separated into two groups and are treated here as "Form *A*" and "Form *B*". While these two groups represent, as I believe, two species only in the Atlantic material, there is much doubt about the specimens from stations east of the Cape. The same general distinction holds good, but there is a lack of correspondence in size and degree of development of appendages in individuals of equivalent stages which makes it fairly certain that other species are represented. Since the legs are almost invariably lost these appendages are not available for specific distinction. Even in the Atlantic material I have found much difficulty in separating the stages in development, since there is much individual variation, and the changes from stage to stage are small.

The differences between the two groups may be given as follows:

Form *A*	Form *B*
Hind-body not much wider than fore-body.	Hind-body very much wider.
Antenna in early stage much longer than antennule.	Antenna in early stage shorter than peduncle of antennule.
Exopod of maxilla enlarging early and always with setae.	Exopod enlarging late, and without setae until last stage.
Coxal spines on maxillipede 3 and leg 1.	No coxal spines.

According to the list given by De Man (1916) the following species of *Panulirus* are recorded from the Atlantic:

P. echinatus, Smith. Pernambuco; Fernando Noronha.

P. argus, Latreille. Bermuda; Antilles; coast of Brazil south to Tropic of Capricorn.

P. laevicauda, Latreille. Tropical east coast of America, from Cuba to Rio de Janeiro.

P. regius, Brito-Capello. Abundant on west coast of Africa from 20° N to 16° S; Cape Verde Islands.

According to Von Bonde (1935) the following species have been taken in the South African region:

P. burgeri, De Haan. From Algoa Bay to Natal.

P. penicillatus, Olivier. Off Natal.

P. ornatus, Fabricius. Off Natal.

P. fasciatus, Fabricius. Off Natal.

Distribution in the Atlantic.

Form *A*, as shown in Table III on p. 407, was taken at twenty stations, between the Cape Verde Islands and St Paul's Rocks; along the west African coast; off Cape Town and Durban. Specimens of the same species are in the British Museum collection from three stations in mid-Atlantic. Small specimens of 7–15 mm. were taken only at Sts. 691 and 692, in the region of St Paul's Rocks, which is probably one of its breeding stations. The only species recorded from this region is *P. guttatus*. A single specimen of 10 mm. taken at St. 701 near the Cape Verde Islands may indicate a breeding centre there, but in that locality *P. regius* is the only possible parent according to present knowledge.

Form *B*, also shown in Table III, was taken in considerable numbers in the equatorial region of the Atlantic. The distribution indicates that the main breeding centre is at St Paul's Rocks, where Form *A* also appears to breed. It is probable that the two forms here dealt with are the Phyllosomas of *P. argus* and *P. regius*, and that both of these species occur at St Paul's Rocks.

Verrill (1922, pls. iii, iiiA) has figured Phyllosomas apparently of my Form *B* from Bermuda, regarding them as belonging to *P. argus*, which is the common species there. As it is claimed that *P. guttatus* also occurs at Bermuda the identification of the Phyllosoma is not certain, but it suggests that Form *B* may be the larva of *P. argus* and Form *A* of *P. regius*.

Table III. *List of stations at which Phyllosomas of* Panulirus, *Forms A and B*, *were taken*

Station	Position	Depth metres	Form *A*		Form *B*	
			No. of specimens	Size mm.	No. of specimens	Size mm.
701	14° 39′ N, 25° 52′ W	242–0	1	10	2	12, 15
699	14° 27′ N, 30° 02′ W	370–0	1	27	—	—
698	12° 21′ N, 30° 07′ W	470–0	2	26, 27	—	—
297	12° 08′ N, 20° 53′ W	300–0	2	14, 18	—	—
294	4° 33′ N, 16° 52′ W	150–0	1	29	—	—
293	4° 18′ N, 16° 51′ W	120–0	1	18	—	—
694	4° 05′ N, 30° 00′ W	210–0	5	13–19	1	9
695	7° 28′ N, 30° 00′ W	370–0	1	20	—	—
704	3° 38′ N, 29° 14′ W	231–0	—	—	Many	10–20
—	2° 09′ N, 13° 33′ W	Surface	1	36	—	—
692	2° 02′ N, 30° 08′ W	350–0	Many	7–15	Many	7–20
—	0° 05′ N, 12° 58′ W	Surface	9	17–38	—	—
705	0° 03′ N, 30° 37′ W	150–0	1	15	18	9–21
691	0° 25′ S, 29° 56′ W	400–0	3	9–10	31	7–10
288	0° 56′ S, 14° 08′ W	163–0	1	20	—	—
—	—	250–0	1	34	—	—
690	3° 18′ S, 30° 00′ W	460–0	—	—	11	9–24
285	2° 43′ S, 0° 56′ W	175–0	1	11	—	—
689	5° 59′ S, 29° 49′ W	400–0	—	—	5	17–26
707	6° 44′ S, 33° 33′ W	182–0	—	—	2	22, 23
688	9° 26′ S, 29° 50′ W	450–0	—	—	6	13–18
686	11° 02′ S, 29° 51′ W	400–0	—	—	2	14, 15
273	9° 38′ S, 12° 42′ E	230–0	5	15–30	—	—
710	21° 45′ S, 39° 50′ W	239–0	1	13	—	—
407	35° 05′ S, 17° 49′ E	150–0	4	14–28	—	—
433	39° 37′ S, 33° 06′ E	93–0	1	21	—	—
1555	39° 52′ S, 18° 42′ E	1000–0	—	—	1	18
1372	34° 02′ S, 34° 02′ E	102–0	—	—	1	16
1374	31° 47′ S, 29° 46′ E	230–0	1	10	—	—
438	30° 05′ S, 32° 05′ E	153–0	—	—	2	24, 29
437	29° 59′ S, 31° 47′ E	123–0	1	29	—	—
1573	24° 36′ S, 39° 54′ E	800–0	—	—	2	7, 8
1574	21° 45′ S, 40° 34′ E	600–0	—	—	4	6–16
1575	18° 33′ S, 41° 35′ E	800–550(–0)	4	14–39	—	—
1576	14° 42′ S, 42° 22′ E	1100–400	—	—	2	12·5–19
1581	7° 42′ S, 44° 14′ E	600–0	—	—	1	25
1582	5° 39′ S, 46° 22′ E	1900–1850 (–0)	27	10–21	—	—

FORM *A*

Six stages may be distinguished in the Discovery material, of which the oldest is without doubt the last before metamorphosis; but there is much individual variation in size and in degree of development of the appendages, so that it is not always easy to fit any one individual into its proper stage. Table IV gives the measurements of a few individuals arranged in order of increasing size, and with indication of the stage represented. It is, of course, possible that the overlap in size and other details which is

found may be due to a mixture of species, but I have not been able to find any evidence of such a mixture.

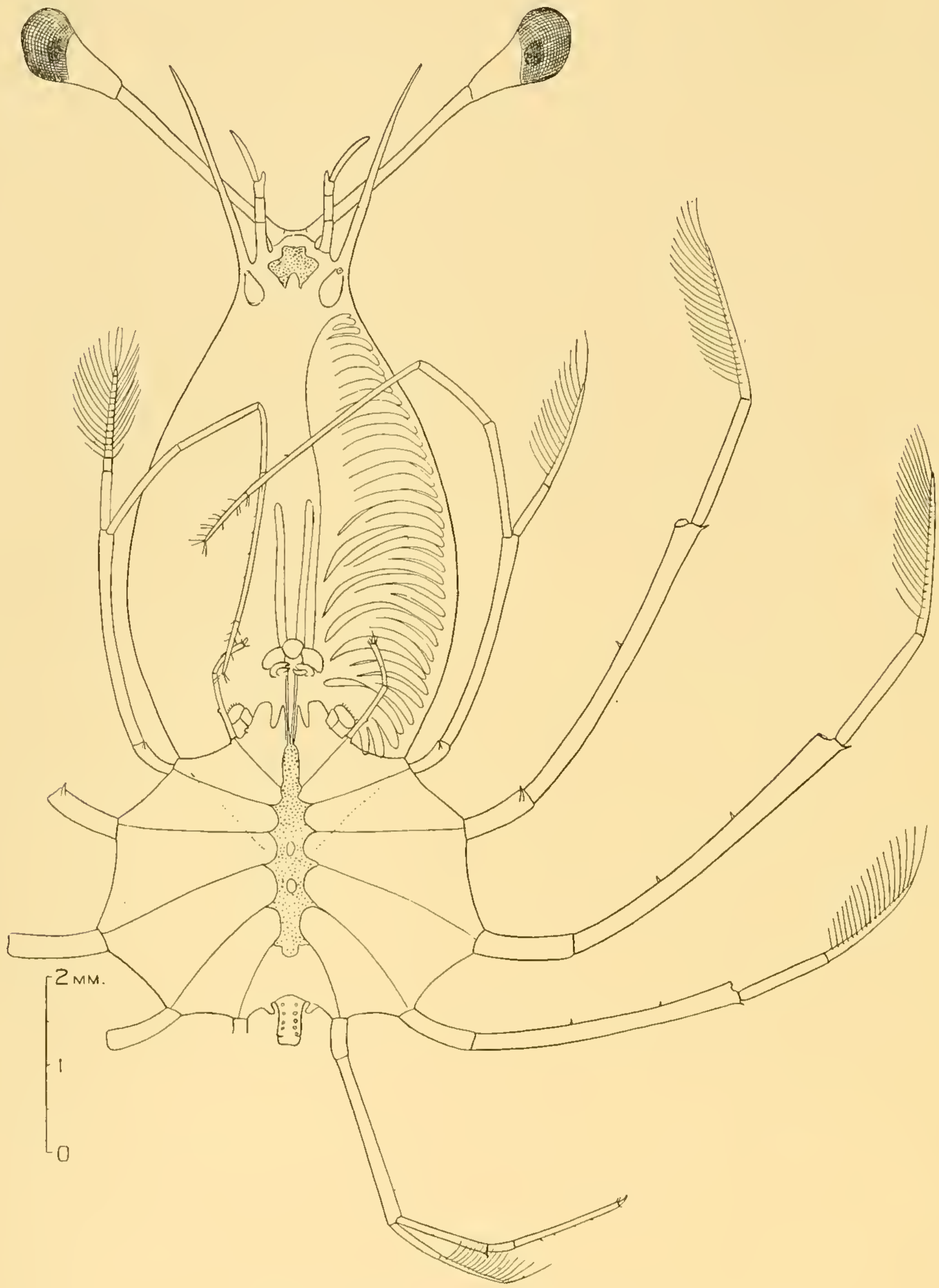


Fig. 17. *Panulirus A*, 9 mm. St. 692.

The earliest stage seen already had the antennular peduncle divided into three segments, a condition which is reached in stage IV in *Palinurus vulgaris* (Bouvier), but not till stage VI in *Scyllarus arctus* (Stephensen). Stage IV in *Palinurus vulgaris* has the abdomen much more developed and stage VI of *Scyllarus arctus* corresponds in

development of the abdomen to the second stage in the Discovery specimens. There is therefore no exact comparison possible between the development of this *Panulirus* and either of the Loricata of which the development is known. All that is certain is that there must be several earlier stages still to be found. The first stage of *P. japonicus*, according

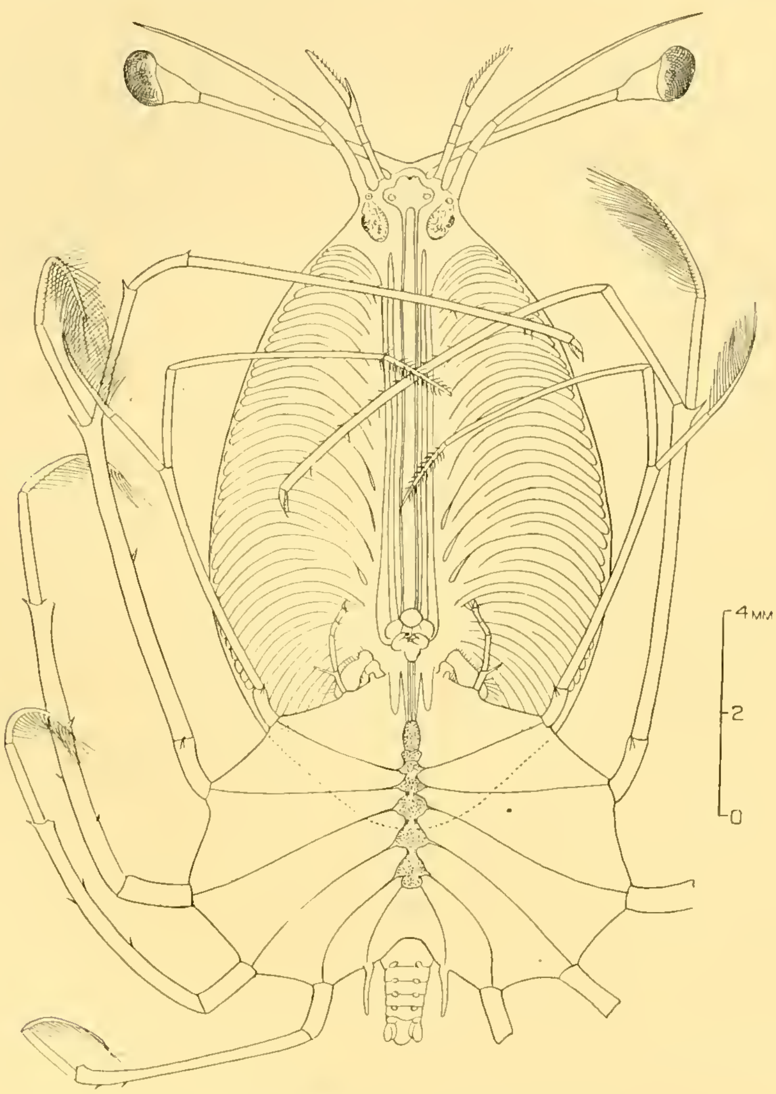


Fig. 18. *Panulirus A*, 18 mm. St. 297.

to the figure of Nakazawa, measures 1·3 mm., and unless the rate of growth is remarkably great, it is necessary to suppose that there are many as five unknown stages, or eleven in all. I have accepted this number provisionally. The actual number of stages may seem a matter of small importance, but it must have some bearing upon the length of larval life and consequently on the possibilities of distribution. It is very disappointing that in this, as in the other cases, the earliest stages are not represented in the material and speculation has to take the place of observation.

STAGE VI ? (Figs. 17, 20). Length 9–12 mm.

Fore-body narrow, pear-shaped, narrower than hind-body: hind-body slightly concave behind.

Antennular peduncle of three distinct segments. Antenna unsegmented, reaching nearly to end of eye-stalk.

Maxilla with exopod very large, fringed with setae. Maxillipede 2 without exopod. Maxillipede 3 and leg 1 with coxal spine. Leg 5 a small papilla.

Abdomen small, narrow, unsegmented, without trace of pleopods, and with a small fold at end representing uropods.

STAGE VII ?. Length 12–18 mm.

Peduncle of antenna not distinct, but showing trace of segmentation under skin.

Maxillipede 1 a small papilla. Maxillipede 2 with small bud representing exopod, without setae. Leg 5 rather large, unsegmented.

Abdomen unsegmented ventrally, but showing segmentation dorsally. Pleopods present as small rounded lobes; uropods bilobed, variable in size.

STAGE VIII ? (Fig. 20). Length 14–20 mm.

Peduncle of antenna distinctly segmented.

Maxillipede 1 a simple papilla. Maxillipede 2 with exopod distinct, with or without setae. Setae when present six in number. Leg 5 with basal segment marked off.

Small spines present on body at base of legs 2, 3, 4. Abdomen segmented ventrally. Pleopods bilobed. Uropods large, the exopod and sometimes also the endopod jointed to basis.

Fig. 18 shows a specimen in some respects intermediate between this and the preceding stage.

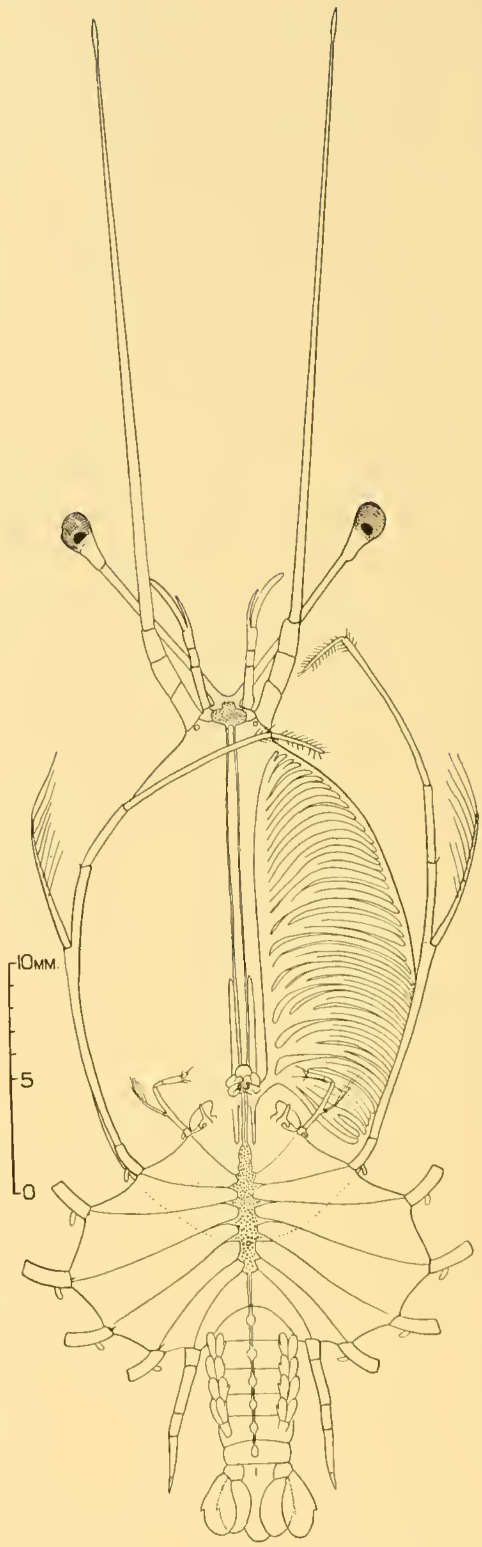


Fig. 19. *Panulirus A*, 36 mm. 0° 05′ N, 12° 58′ W.

STAGE IX? (Fig. 20). Length 25–28 mm.

Maxillipede 1 enlarging at base. Exopod of maxillipede 2 with eight setae. Leg 5 of four segments.

Pleopods larger, biramous.

STAGE X?. Length 22–34 mm.

Maxillipede 1 with epipod; endopod not reaching edge of maxilla. Exopod of maxillipede 2 with ten setae. Legs with epipods; gills not developed, but they can be traced under the skin as small round cellular masses.

Abdomen fully developed, somite 6 with a pair of large dorsal spines at base of telson. Pleopods large, without appendix interna. Uropods large, with small outer spine on margin of exopod.

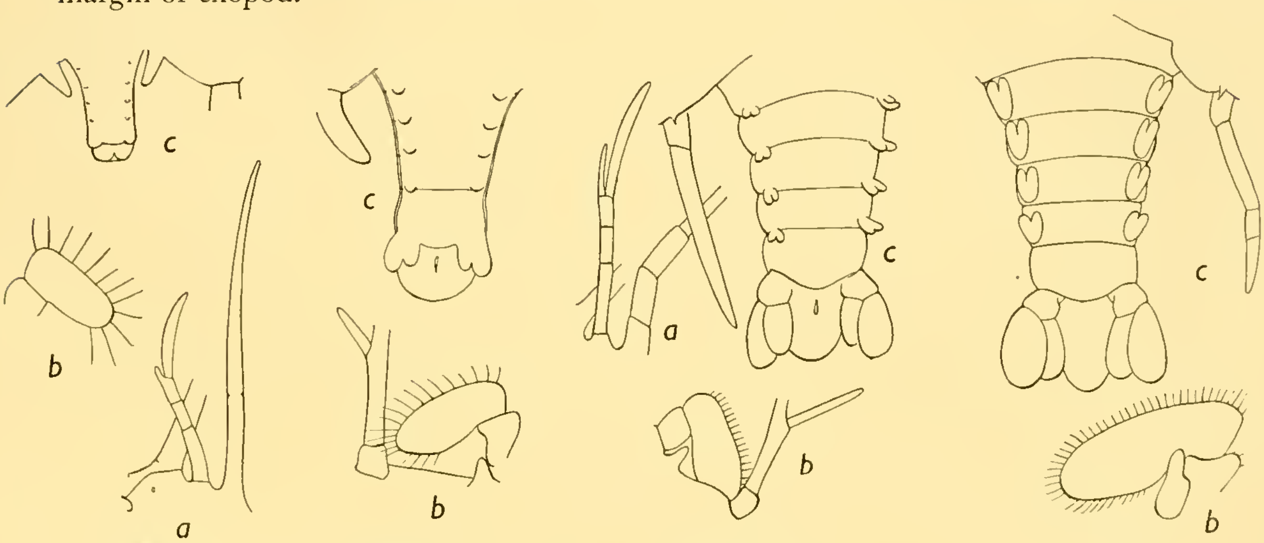


Fig. 20. *Panulirus A*, Stages VI–IX.

a. Antennae. *b.* Maxilla, etc. *c.* Abdomen.

STAGE XI? (Fig. 19). Length 28–36 mm.

Maxillipede 1 with endopod longer, sometimes extending to edge of maxilla. Exopod of maxillipede 2 with sixteen setae. Legs with bilobed epipods and gills.

Pleopods with appendix interna. Uropods with large outer marginal spine on both branches.

FORM *B*

The material of this form from the Atlantic appears to belong to one species only, but the eastern specimens, though of precisely the same type, do not seem to be the same if similar stages are compared. For instance, in the table of measurements, a specimen from St. 438 is included which, though evidently in the same stage as one from St. 690 of 20 mm., differs so much in its measurements that it cannot well belong to the same species.

In the Atlantic form only five stages can be distinguished, the youngest of which is taken to be stage V, making nine stages in all. I have found only one specimen of the

oldest stage, and this one is not in some respects so advanced as the oldest of Form *A*, so that there may be another later stage. Stage V was abundant at St. 692 (thirty-one specimens) and showed a range of size from 7 to 11 mm. There is considerable difference

Table IV. *Measurements (in mm.) of Phyllosomas belonging to* Panulirus, *Form A*

Stage	Station	Total length	Abdomen	Antennule Segment 1	Antennule Segment 2	Antennule Segment 3	Antenna	Eye	Eye-stalk	Body/Eye-stalk	Exopod of maxillipede 2
VI	692	9·5	0·6	0·37	0·24	0·16	2·55	1·45	2·6	3·6	None
VI	692	10·5	0·75	0·41	0·24	0·14	2·95	1·5	3·0	3·5	,,
VI	692	11·2	0·75	0·47	0·27	0·22	3·2	1·6	3·1	3·6	Small bud
VII	692	12·2	0·8	0·55	0·29	0·24	3·0	1·65	3·77	3·2	,,
VII	694	14·1	1·0	0·59	0·35	0·33	4·1	1·7	4·0	3·5	,,
VII	692	15·3	1·25	0·69	0·37	0·29	4·75	1·8	5·0	3·0	,,
VIII	694	19·45	1·8	0·86	0·43	0·37	5·75	2·0	5·8	3·3	Longer, with small setae
IX	695	20·3	2·4	1·06	0·47	0·47	7·4	2·0	6·0	3·4	,,
X	273	24·0	4·8	1·12	0·55	0·47	12·55	2·2	6·0	4·0	,,
XI	273	32·0	6·0	1·49	0·73	0·76	20·8	2·6	9·0	3·5	Longer, with long setae
XI	288	28	8·5	1·42	0·69	0·69	30	2·3	6·8	4·1	,,
XI	2° 09 N / 12° 33 W	36	9·0	1·71	0·82	0·71	31·3	2·65	8·4	4·3	,,

between the smallest and largest with regard to the development of antennae and the rudiment of the uropods, but they grade into one another and there is no evidence for a moult separating them into two stages. Measurements of the specimens are given in Table V.

Table V. *Measurements (in mm.) of Phyllosomas belonging to* Panulirus, *Form B*

Stage	Station	Length	Abdomen	Antennule Segment 1	Antennule Segment 2	Antennule Segment 3	Antenna	Eye	Eye-stalk	Body/Eye-stalk	Exopod of maxillipede 2
V	691	7·6	0·5	0·37	0·20	0·20	0·63	1·3	1·95	3·86	None
V	691	9·3	0·6	0·49	0·22	0·24	1·08	1·35	2·5	3·72	,,
V	691	10·0	0·6	0·51	0·27	0·20	1·65	1·5	3·0	3·33	,,
V	691	11·0	0·75	0·57	0·29	0·27	1·62	1·5	3·3	3·33	,,
VI	690	12·5	0·95	0·61	0·29	0·31	2·0	1·7	3·7	3·37	,,
VI	691	14·0	1·1	0·76	0·33	0·35	2·75	1·8	4·3	3·25	,,
VII	690	17·0	2·0	0·92	0·39	0·41	4·2	1·9	4·6	3·7	Rudiment
VIII	690	20	3·4	1·06	0·41	0·51	5·6	2·2	5·7	3·5	Longer, without setae
IX	690	23	5·75	1·24	0·59	0·59	10·7	2·2	5·6	3·9	With setae
VIII	438	28	5·3	1·63	0·67	0·67	11·5	2·4	8·4	3·3	Without setae

STAGE V? (Fig. 21). Length 7–11 mm.

Fore-body very narrow, much narrower than hind-body. Hind-body deeply concave behind. Abdomen very small, unsegmented, and without trace of pleopods. The uropods are represented by an inconspicuous fold or by a pair of distinct lobes.

Peduncle of antennule of three segments. Antenna shorter than peduncle of antennule, or, in larger specimens, considerably longer.

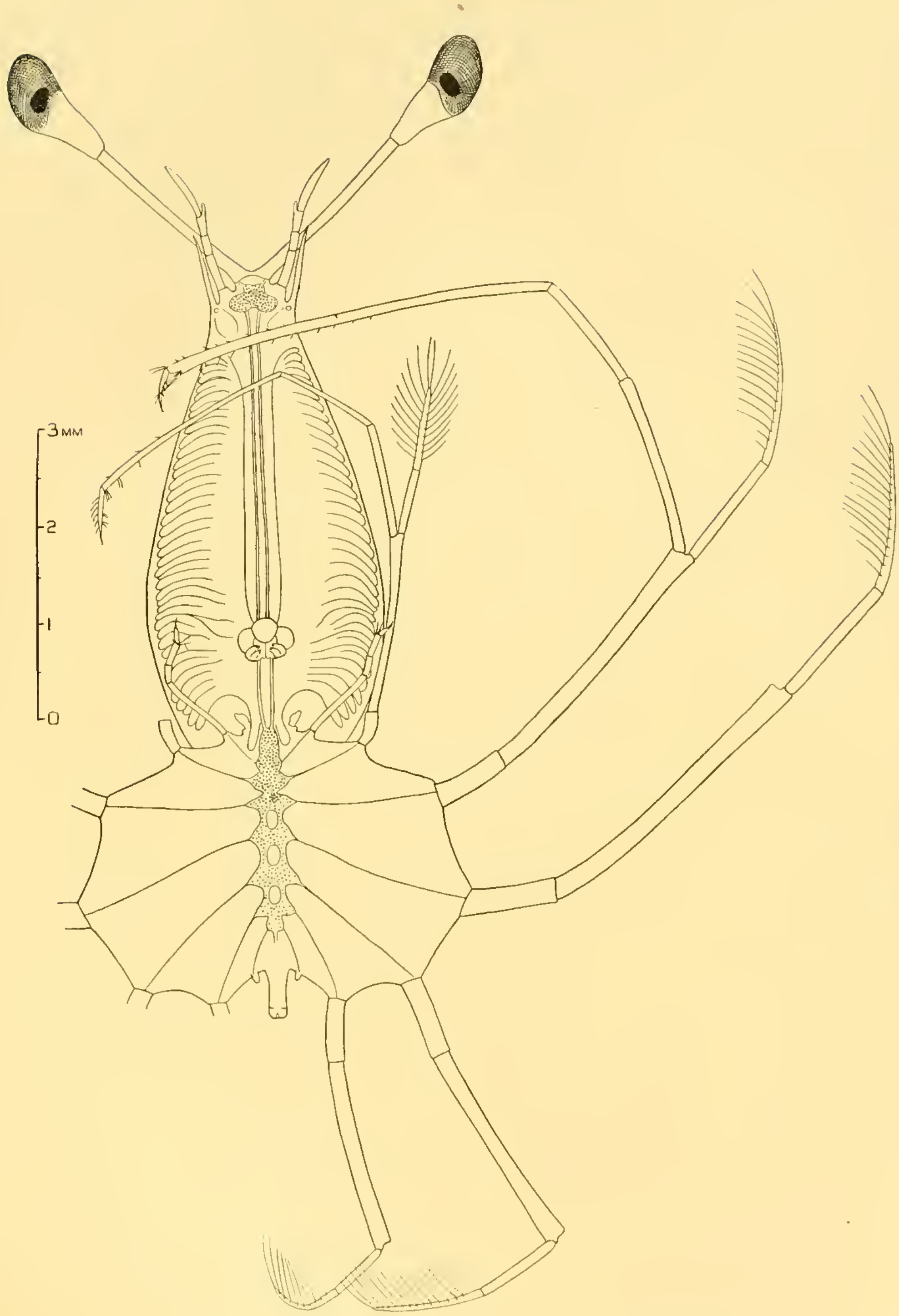


Fig. 21. *Panulirus B*, Stage V ?, 7·7 mm. St. 692.

Maxillule without palp. Maxillipede 1 either quite absent, or present as a minute papilla. Maxillipede 2 without exopod. Maxillipede 3 with setose exopod, but without coxal spine. Legs without coxal spine. Leg 4 endopod not fully developed, the dactylus rounded at end, without spines. Leg 5 a minute papilla.

STAGE VI ?. Length 12·5–17 mm.

Peduncle of antenna segmented, the flagellum as long as the antennule.

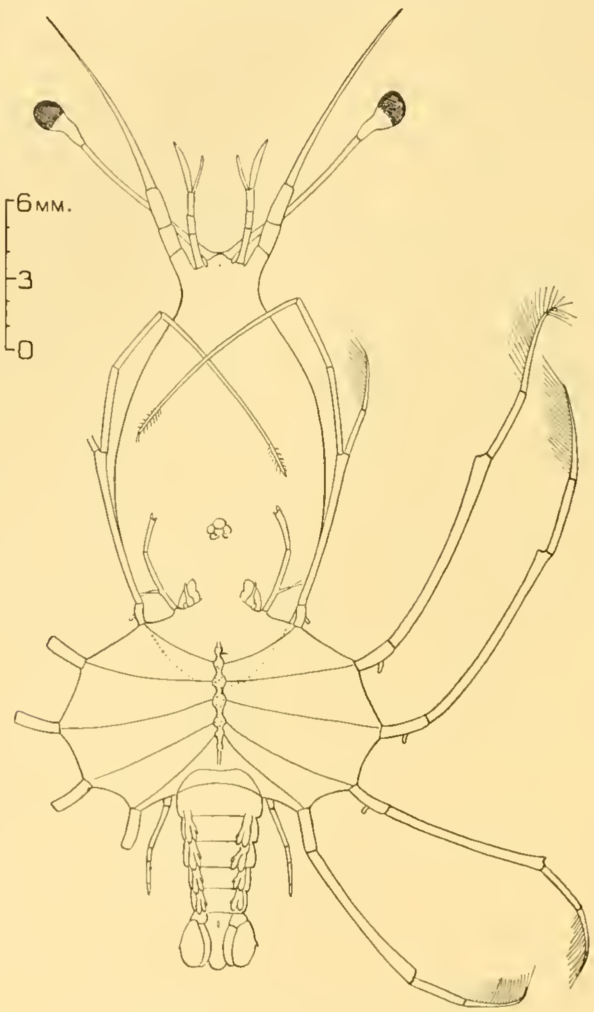


Fig. 22. *Panulirus B*, Stage IX ?, 26 mm. St. 689.

Maxilla not enlarged distally, without setae. Maxillipede 2 without exopod. Leg 5 longer, unsegmented.

Abdomen larger, not segmented. Pleopods represented by simple papillae. Uropods bilobed.

STAGE VII ?. Length 16–20 mm.

Flagellum of antenna longer than antennule.

Maxilla with exopod produced backwards, without setae. Maxillipede 2 with rudiment of exopod, without setae. Leg 5 larger, in some cases with basal segment distinct.

Abdomen segmented dorsally. Pleopods bilobed. Uropods large, biramous, the exopod jointed to basis.

Stage VIII ?. Length 20–23 mm.

Antenna very much longer.

Maxilla much larger, but not reaching back as far as maxillipede 2. Maxillipede 1 finger-like, enlarging at base. Exopod of maxillipede 2 longer, but without setae. Leg 5 reaching to end of somite 5, with basal segment distinct.

Abdomen fully segmented; somite 6 without dorsal spines. Pleopods deeply bilobed; uropods with both rami jointed to basis.

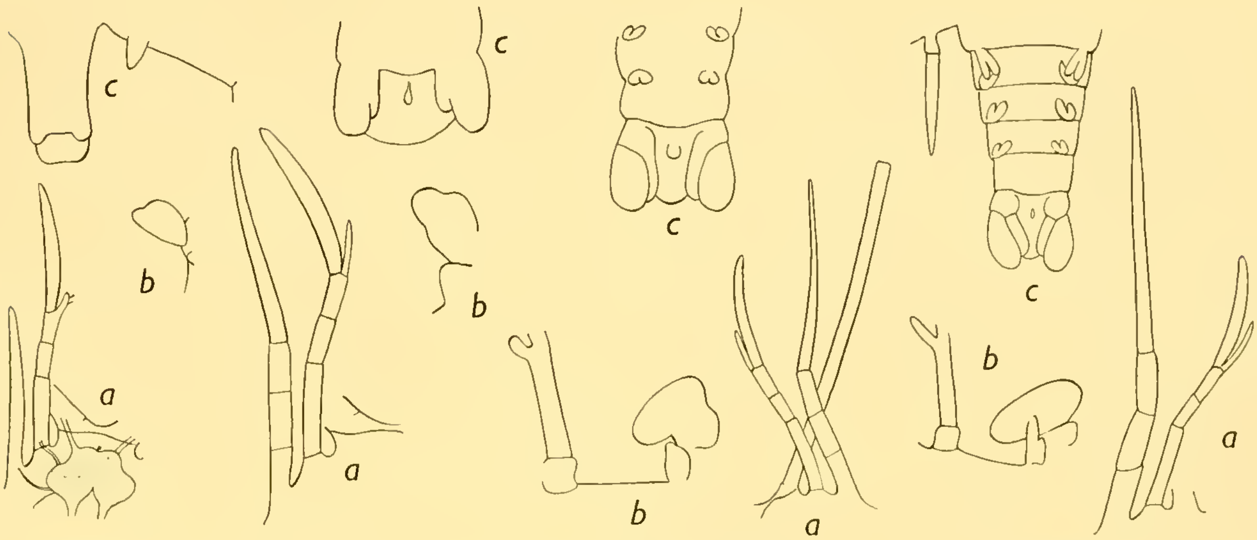


Fig. 23. *Panulirus B*, Stages V–VIII?.

a. Antennae. *b*. Maxilla, etc. *c*. Abdomen.

Stage IX ? (Fig. 22). Length 23–26 mm.

Maxilla reaching back almost to maxillipede 2, with setae along margin. Maxillipede 1 with large epipod. Maxillipede 2 with exopod bearing setae. Maxillipedes and legs with gill rudiments and epipods; one pleurobranch on legs 1 and 5 and two on legs 2–4. Leg 5 with five distinct segments.

Abdomen fully segmented, somite 6 with a pair of large dorsal spines at base of uropods. Pleopods large, with appendix interna. Uropods with small tooth on outer margin of exopod.

Panulirus ?, Form *D* (Figs. 24–27)

Fore-body pear-shaped, narrow in front, narrower than hind-body. Hind-body slightly hollowed behind in later stages.

Antennule with segments 2 and 3 of peduncle nearly equal, and about half length of segment 1. Antenna slender, longer than antennule in earliest stages.

Maxillule without palp. Maxilla with exopod setose. Maxillipede 2 without exopod in early stages, later with setose exopod. Maxillipede 3 with setose exopod from earliest stage. Legs with large ventral coxal spines, and large dorsal coxal spines on legs 2 and 3. Leg 5 unbranched, close to abdomen. Dactylus of leg 2 elongated.

The position of this Phyllosoma is very doubtful. In general form, and in the lengths of the antennular segments, it agrees with those Phyllosomas which are referred to *Panulirus*, but in the retarded development of leg 4 it resembles *Palinurus*. It seems most probable that it belongs to a distinct genus, but I refer it none the less provisionally to *Panulirus*.

The series of specimens is not sufficiently large to give good evidence for the number of stages passed through, but it is possible to distinguish seven, or perhaps eight. As the smallest must be in stage II or III, the total number would be eight or nine. Measurements of the specimens are given in Table VII. The specimen of 7·4 mm. is much more advanced in some respects than that of 8 mm. and may perhaps represent a different species.

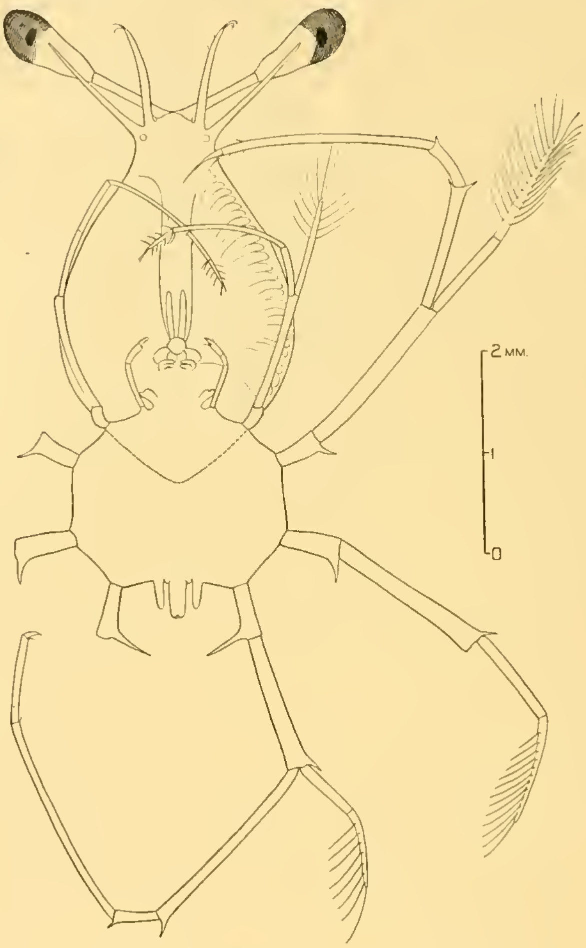


Fig. 24. *Panulirus D*, 5 mm. St. 701.

As will be seen from Table VI, this form was taken at 11 stations, from 11° 25′ S, 42° 03′ E (off Zanzibar) southwards to beyond the Cape in 38° 02′ S and 17° 50′ E. All these specimens appear to be of one species. In addition two small specimens from St. 701 in the Atlantic are included in the table and shown in Fig. 24. They do not belong to the same species, being of rather different shape, and showing some differences in the spines on the legs; but they cannot be referred to either of the Atlantic species of *Panulirus* described above. If they are, as they appear to be, closely allied to the eastern form, that would be some evidence that this is a generic rather than a specific type.

Genus Jasus, Parker

The first larva of the eastern form of *Jasus lalandii* has been described by Thomson (1907), Anderton (1907) and Archey (1916), and for the South African form by Gilchrist (1913). In both cases the larva, when first hatched, has a very peculiar form. The

antennae are large biramous organs with long setae, by means of which the animal swims actively, while the maxillipedes and legs are coiled up and functionless. Moulting takes place in a few hours, and a normal Phyllosoma appears. To the first stage Gilchrist gave the name Naupliosoma. It is clear that the naupliosoma represents the prezoeal stage which, in this case alone among the Loricata, so far as is known, retains the swimming antenna, as in some Brachyura. If the prezoea can rightly be regarded as a reminiscence of the nauplius, the name naupliosoma is well chosen. Gilchrist suggests that this active stage is retained in order that the surface may be reached more rapidly than a normal Phyllosoma would be able to do.

Table VI. *List of stations at which Phyllosomas of* Panulirus, *Form D, were taken*

Station	Position	Depth metres	No. of specimens	Size mm.
701	14° 39′ N, 25° 52′ W	242–0	2	5
1578	11° 25′ S, 42° 03′ E	500–0	1	4
1576	14° 42′ S, 42° 22′ E	400–0	1	29
1575	18° 33′ S, 41° 35′ E	800–550	1	7
1574	21° 45′ S, 40° 34′ E	600–0	1	12·5
1571	27° 24′ S, 39° 21′ E	500–0	1	13·5
441	31° 24′ S, 31° 12′ E	180	1	20
1373	31° 13′ S, 31° 49′ E	135–0	1	12
1568	34° 48′ S, 34° 28′ E	1400–0	4	9–16·6
1375	34° 31′ S, 26° 19′ E	210	1	13·7
407	35° 05′ S, 17° 49′ E	150–0	2	8, 15
1554	38° 03′ S, 18° 40′ E	1500–0	2	5·7, 8·5

Table VII. *Measurements (in mm.) of Phyllosomas belonging to* Panulirus, *Form D*

Station	1578	701	1554	1575	407	1554	1568	1568
Length	4·15	5·0	5·7	7·4	8·0	8·5	9·0	11·9
Eye, with stalk	1·88	1·95	2·2	3·15	3·0	3·2	3·5	4·4
Antennular peduncle								
Segment 1	Unsegmented	Unsegmented	Unsegmented	0·57	Two segments	0·59	0·45	0·35
Segment 2				0·35		0·31	0·22	0·29
Segment 3				0·29		0·35	0·22	0·27
Exopod of maxillipede 2	—	—	—	—	—	—	—	—

Station	1373	1574	1571	1375	407	1568	441	1576
Length	12	12·55	13·4	13·7	15	16·6	20	29
Eye, with stalk	—	4·6	4·8	5·2	—	6·2	—	9·5
Antennular peduncle:								
Segment 1	—	0·65	0·61	0·61	0·65	1·56	0·98	1·56
Segment 2	—	0·33	0·33	0·31	0·37	0·73	0·45	0·73
Segment 3	—	0·31	0·33	0·29	0·39	0·71	0·43	0·71
Exopod of maxillipede 2	—	Rudimentary	Rudimentary	Short small setae	Short, no setae	Small, no setae	Small, with 6 setae	Large, setose

It is a matter of great difficulty to determine how many stages there may be in the development of *Jasus*, since apart from stage I Gilchrist obtained only a single specimen (of 3·8 mm.) of another early stage. Von Bonde (1932) did not add to our knowledge of this species. The Discovery material consists of about fifty specimens all much older than this specimen of Gilchrist's. Taking as a basis specimens of four distinguishable stages from St. 85, it is found that these increase in size by a growth factor of about 1·3,

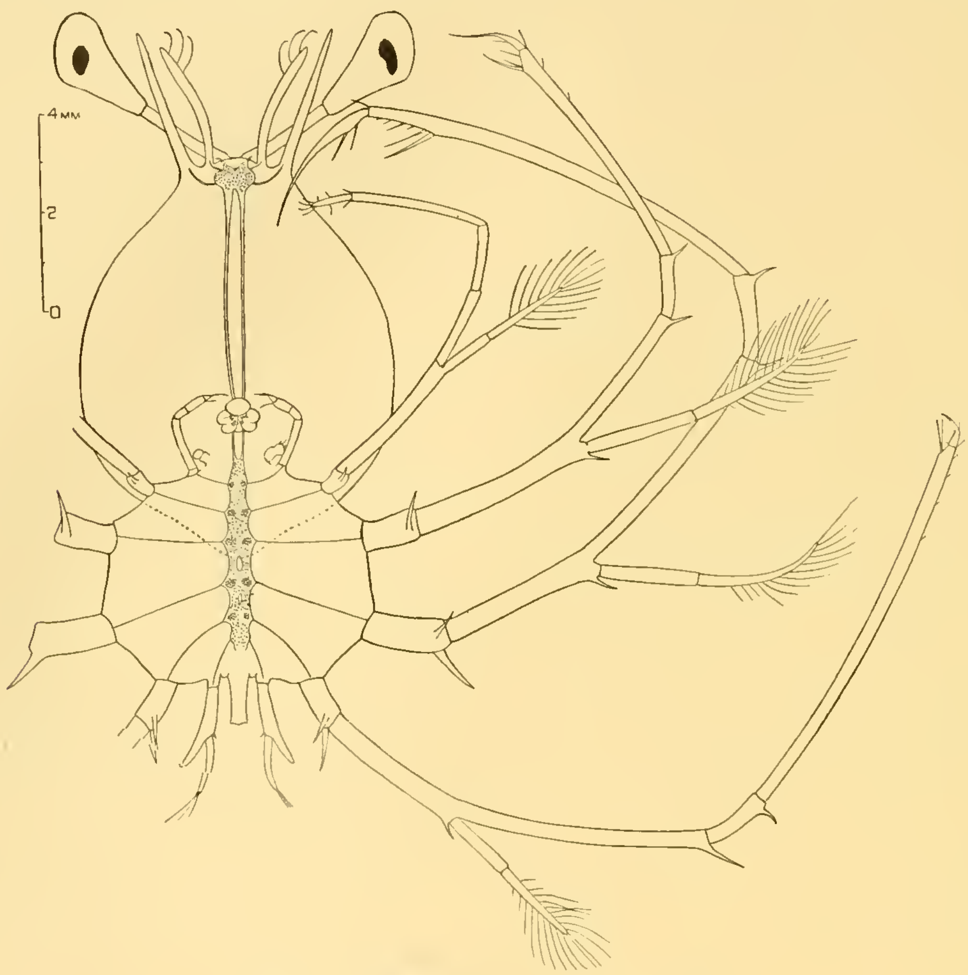


Fig. 25. *Panulirus D*, 5·7 mm. St. 1554.

whether total length is taken or pre- or post-labral length, showing that in these particular stages (from 10·4 to 22·75 mm.) there is no appreciable differential rate of growth. The fifty specimens measured fall into six groups of which the average sizes are:

Average size (mm.)	Growth factor
10·5	—
13·57	1·29
16·5	1·22
20·8	1·26
28·6	1·36
35·0	1·23

The growth factor remains about 1·3 or less, and one cannot therefore assume a greater rate of growth for earlier stages. If that is so we are forced to conclude that there are as many as thirteen stages, and that Gilchrist's larva of 3·8 mm. is stage 4. Bouvier and Santucci agree in finding nine stages in *Palinurus vulgaris*, and Stephensen found the same number in *Scyllarus arctus*. Gilchrist's larva is even less developed than stage II of *Palinurus*, and it is difficult to believe that it can represent a later stage. In any case

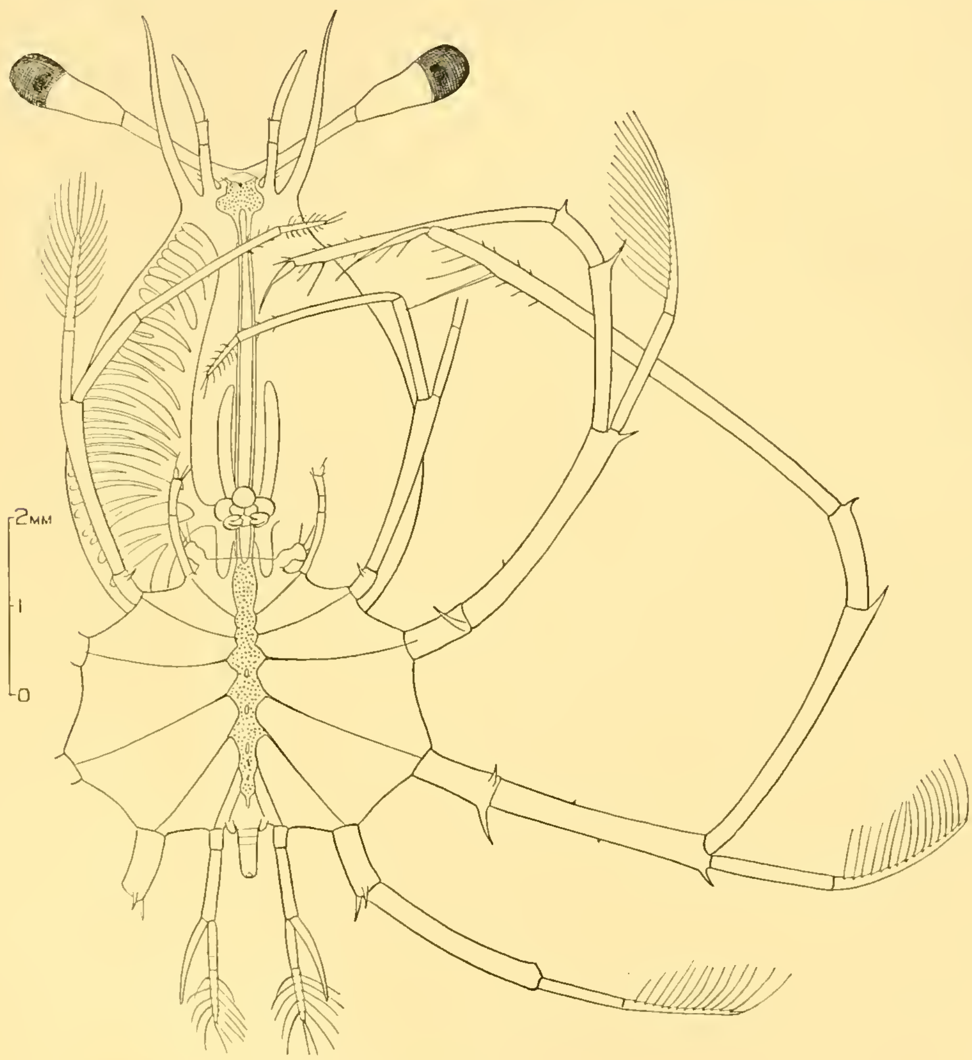


Fig. 26. *Panulirus D*, 8 mm. St. 407.

there seems to be a gap of three unknown stages between this larva of 3·8 mm. and the youngest of the Discovery specimens.

Our knowledge of the development of the European forms is not so securely founded that we are entitled to assume a similar course in other genera and species, and having regard to the wide distribution and great size reached by some of them, there may well be a longer period of larval life and a greater number of stages. Consequently I have, for the purposes of this report, accepted a provisional arrangement into thirteen stages,

which has the advantage of drawing special attention to the wide gap in our knowledge of this species.

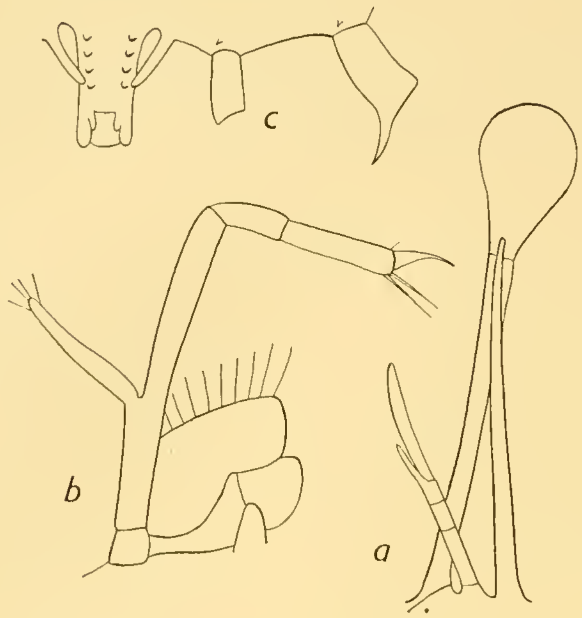


Fig. 27. *Panulirus D*, 13·7 mm. St. 1375.
a. Antennae. *b.* Maxilla, etc. *c.* Abdomen.

CHARACTERS OF THE PHYLLOSOMA OF *JASUS LALANDII*.

Fore-body as wide as or wider than long. Hind-body very much narrower than fore-body, not hollowed behind. Abdomen narrow.

Antenna slender, with long flagellum.

Maxillipedes 2 and 3 without exopod, or with minute rudiment of it. Maxillule without palp. Leg 5 closely apposed to abdomen, developing very early and without exopod, or with minute rudiment of it.

While the structure of the antennae and the form of the abdomen are those characteristic of a genus of the Palinuridae, the absence of the exopod from maxillipede 3 is remarkable. The exopod of maxillipede 2 always develops late and its loss, even in a Palinurid, would not be surprising; but the absence of the exopod in maxillipede 3, seeing that it is functional from the earliest stage in *Palinurus* and *Panulirus*, is most unexpected. It is absent in all Scyllaridae known.

Jasus lalandii (Lamarck)

STAGE VIII? (Fig. 28). Length 10–11 mm.

Carapace broader than long. Abdomen very small, parallel-sided, unsegmented, with a small spinous process at each posterior angle.

Eye-stalk longer than eye, eye and stalk together more than one-third of total body length. Antennule with peduncle of three segments, segments 2 and 3 about equal, and about half length of segment 1; endopod about one-fifth of exopod. Antenna with peduncle indistinctly segmented, a small inner spine at position of end of segment 3.

Maxillule without palp. Maxilla with distal part not expanded, with four setae. Maxillipede 1 just traceable as a small swelling. Maxillipedes 2 and 3 without trace of exopod. Maxillipede 3 and legs each with large spine on coxa. Leg 5 fully developed, very long, without exopod.

Pleopods traceable under skin. Uropods represented by very small simple folds.

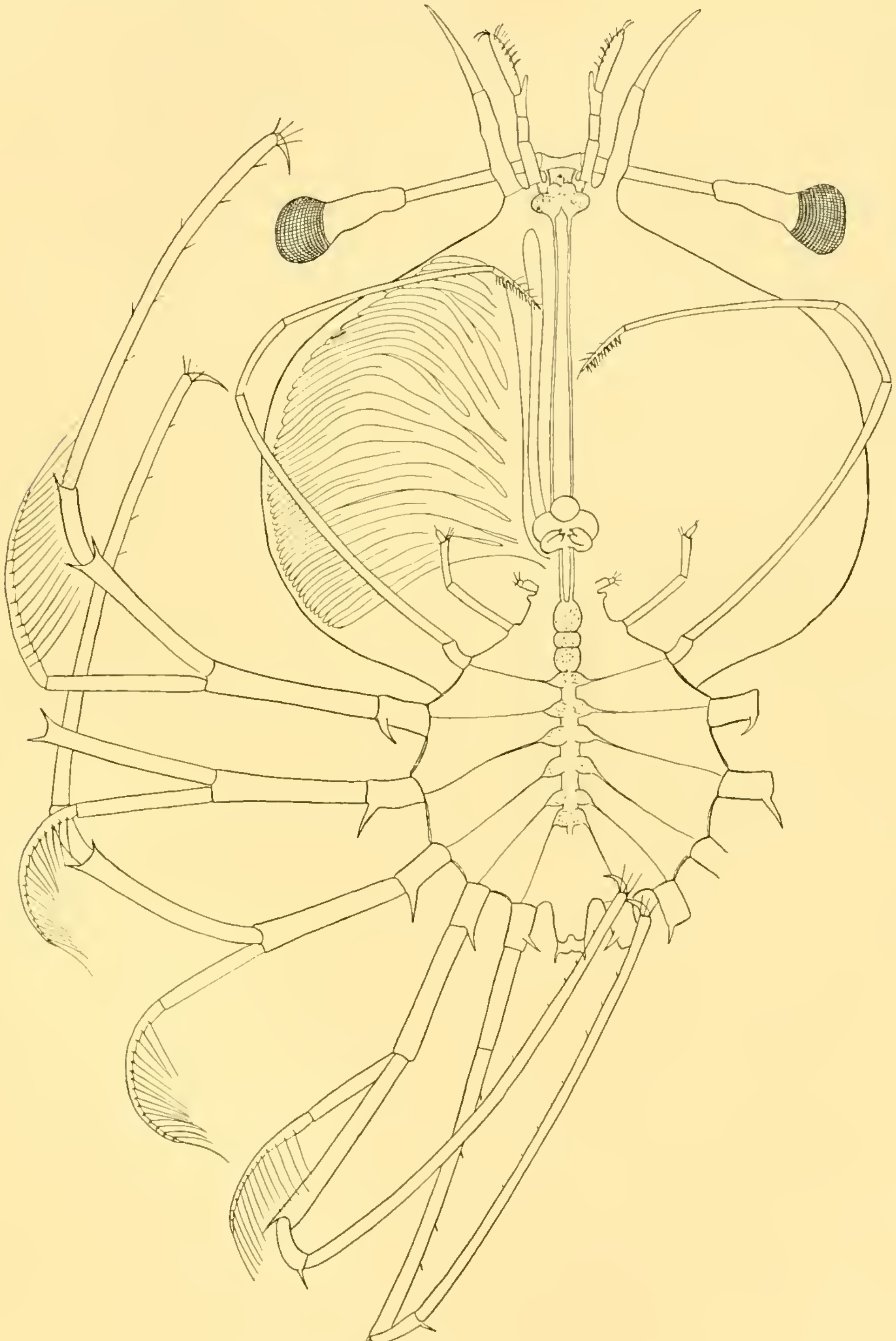


Fig. 28. *Jasus lalandii*, Stage VIII ?, 11 mm. St. 254.

Stage IX ?. Length 12·5–15 mm.

Abdomen broadened at base; telson marked off, with large spinous process at each angle.

Eye about one-third of body length. Antennule, segments of peduncle the same, endopod and exopod longer. Antenna with peduncle distinctly segmented, with inner spine of segment 3.

Maxilla unchanged; maxillipede 1 a small papilla. Maxillipedes 2 and 3 without exopod.

Pleopods present as small simple lobes; uropods larger, but generally simple. In some cases a distinction of endopod from exopod is traceable.

Stage X ?. Length 15–17 mm.

The only marked difference between this and the preceding stage is that the uropods are distinctly bilobed, but there is an increase in length of the endopod of the antennule and of the antenna which is shown in Table VIII.

While the maxilla is generally unchanged, it may, in the largest specimens, show enlargement of the exopod, which may have seven setae.

Stage XI ?. Length 19–23 mm.

Abdomen stout, the telson narrowing and rounded at end, without spines.

Eye less than one-third of body length.

Maxilla with exopod greatly enlarged, with about eleven setae, but not reaching back as far as maxillipede 2. Maxillipede 1 larger, but still a simple process. Maxillipedes 2 and 3 without exopods.

Pleopods larger, bilobed; uropods nearly as long as telson, biramous, but the rami not segmented. There may be a trace of a joint at the base of the exopod.

Stage XII ?. Length 27–31 mm.

This stage differs very little from stage XI except in general growth as shown by the measurements, but may easily be distinguished by the larger, biramous, pleopods without trace of appendix interna, and the larger uropods. The exopod of the latter is distinctly jointed, and the outer margin smooth.

Telson as before, with smooth margin.

Stage XIII ? (Fig. 29). Length 33–37·5 mm.

Maxilla with exopod extending back to maxillipede 2. Maxillipede 1 with large epipod and finger-like process representing endopod. Maxillipede 2 with rudimentary exopod. Maxillipede 3 with small knob representing exopod. Small epipods and gills present on legs in full adult number.

Pleopods large, flattened, with appendix interna on each. Uropods slightly longer than telson, the rami jointed to basis, exopod serrated on outer margin.

Telson truncated, with small sharp points along margin.

This, which is without doubt the last stage before the moult to the Puerulus, has been fully described by Gilchrist. He drew attention to a peculiar elevation dorsally behind

the eye, which he interpreted as the rostrum. I do not find this structure as prominent as he figures it, but it is quite possible that it may be the forerunner of the rostrum.

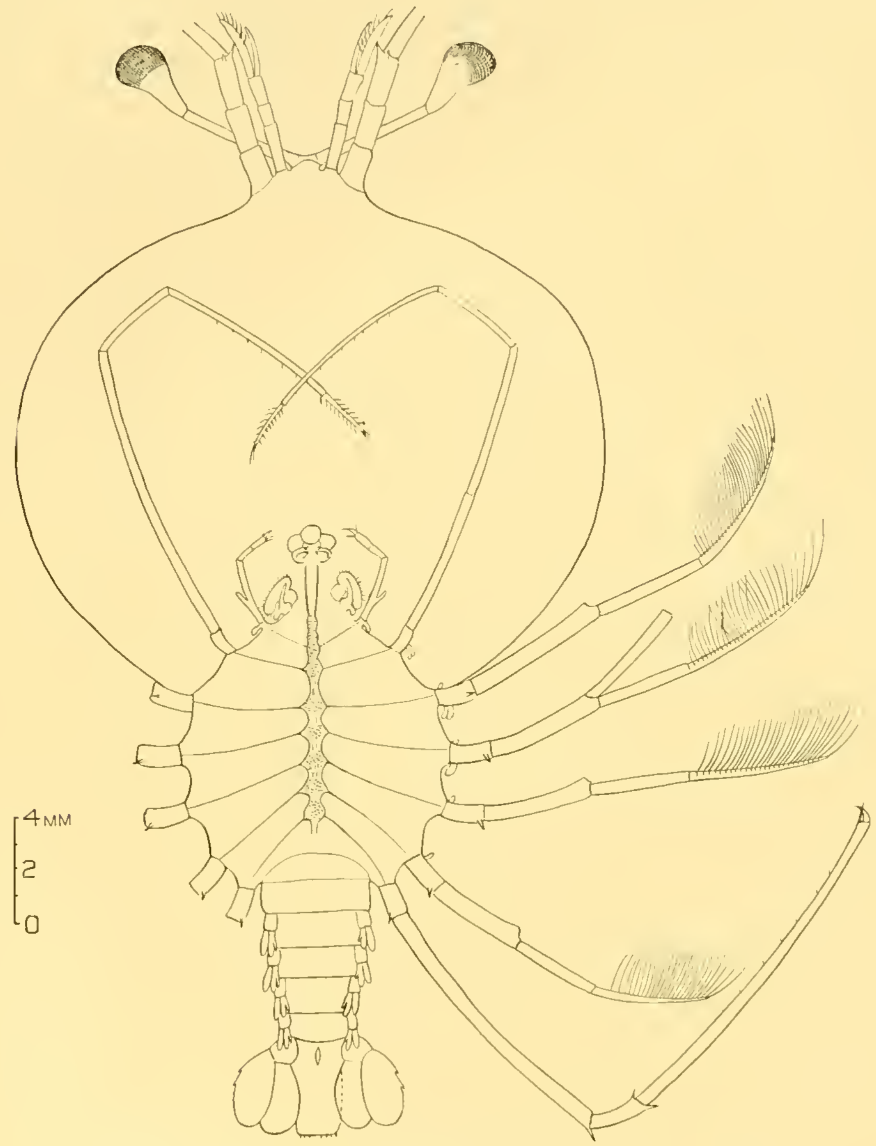


Fig. 29. *Jasus lalandii*, Stage XIII ?, 37 mm. St. 100 B.

DISTRIBUTION.

Table IX shows the distribution of seventy-one specimens. The most northerly station is 268 (18° 37′ S) and the most southerly is 448 (39° 03′ S); but the majority were taken in the region of the Cape and between the Cape and Tristan da Cunha, where the adult is known to occur. Apart from St. 247, which is close to Tristan, it was not taken to the west of that point, nor in the neighbourhood of Gough Island. The area of distribution is therefore restricted, and seems to correspond closely with the limit of the subtropical convergence. The smallest individuals, of 10–11 mm., are extremely rare, but it is worth noting that one of them (St. 85) was taken about 900 miles from the nearest

land. Unfortunately, as the series of larvae is so incomplete, one can only guess at the age as expressed in the number of the stage, and I am by no means satisfied that the assumption that this larva is in stage VIII is correct. At all events it cannot be older. We know too little about the duration of stages to estimate age in days, but a guess of six weeks may be fairly near the truth. In any case there is evidence here of rapid and extensive travel.

Table VIII. *Measurements of Phyllosomas of* Jasus lalandii

Stage	Length			Antennule					Eye	Eye-stalk	Antenna
				Peduncle			Exopod	Endopod			
	Total	Pre-labral	Post-labral	Segment 1	Segment 2	Segment 3					
VIII	10·4	4·4	6·0	2·15	1	1	3·68	0·69	1·65	2·1	2·8
IX	12·95	5·65	7·3	2·36	1	0·85	4·0	0·84	1·95	2·5	3·2
X	16·85	7·3	9·55	2·47	1	1·1	3·85	1·2	2·3	3·4	5·6
XI	22·75	9·75	12·95	2·32	1	1·13	3·75	1·67	2·5	3·7	8·1
XII	28·5	12·0	16·5	2·29	1	1·13	3·9	2·5	3·0	4·7	11
XIII	37·5	15	22·5	2·45	1	1·3	3·35	2·7	3·0	5·0	17
Specimens from St. 1377											
X	17·8	7·8	10·0	2·55	1	1·24	4·1	1·43	2·4	2·8	—
X	19·65	8·7	10·9	2·65	1	1·14	4·25	1·45	2·4	3·7	6·2
XI	22·9	9·5	13·5	2·37	1	1·12	3·48	1·4	2·65	4·2	8·4

Measurements in millimetres except for antennule where proportional lengths of segments are given.

Table IX. *List of stations at which Phyllosomas of* Jasus lalandii *were taken*

Station	Position	Depth metres	Number of specimens	Size mm.	Puerulus
268	18° 37′ S, 10° 46′ E	73–0	1	15	—
80	32° 46′ S, 10° 00′ W	30–0	2	11, 15	—
81	32° 45′ S, 8° 47′ W	650–0	2	15, 17	—
82	32° 42′ S, 2° 05′ W	75–0	3	15–17	—
83	32° 30′ S, 1° 23′ W	650–0	2	17, 21	—
264	33° 06′ S, 16° 55′ E	80–0	1	15	—
85	33° 07′ S, 4° 30′ E	2000–0	21	10–23	—
86	33° 25′ S, 6° 31′ E	1000–0	1	14	—
413	33° 13′ S, 15° 46′ E	350–0	3	27–34	—
100	33° 33′ S, 15° 13′ E	250	2	37	3
—	—	900–1000	1	36	—
—	—	350–400(–0)	11	28–36	—
101	34° 01′ S, 15° 56′ E	850–950	3	32–37	—
—	—	1310–1410	1	35	—
—	—	2480–2580	3	35–37	—
102	35° 29′ S, 18° 33′ E	52	1	—	—
257	35° 01′ S, 10° 18′ E	250–0	3	10–20	—
258	35° 03′ S, 13° 55′ E	320–450	1	16	—
254	35° 04′ S, 2° 59′ E	200–0	1	11	—
247	37° 20′ S, 12° 47′ W	100–115(–0)	1	31	—
407	35° 08′ S, 17° 49′ E	150–0	1	34	—
—	—	275–0	1	34	—
—	—	800–950	1	33	—
1377	38° 36′ S, 9° 03′ E	100	3	17–22	—
448	39° 03′ S, 16° 11′ E	161–0	1	27	—

Most of the samples in which these Phyllosomas occurred were taken in deep water, but as the hauls were generally continued to the surface, they offer little evidence concerning vertical distribution. A few of the hauls (Sts. 100, 101, 102, 1377) prove, however, that the larvae do reach very considerable depths, even to 2480–2580 m. The specimens from deep water are nearly all in the last stage. Three specimens of the Puerulus stage were caught at 250 m. at St. 100, about 170 miles from land and in an ocean depth of over 3000 m.

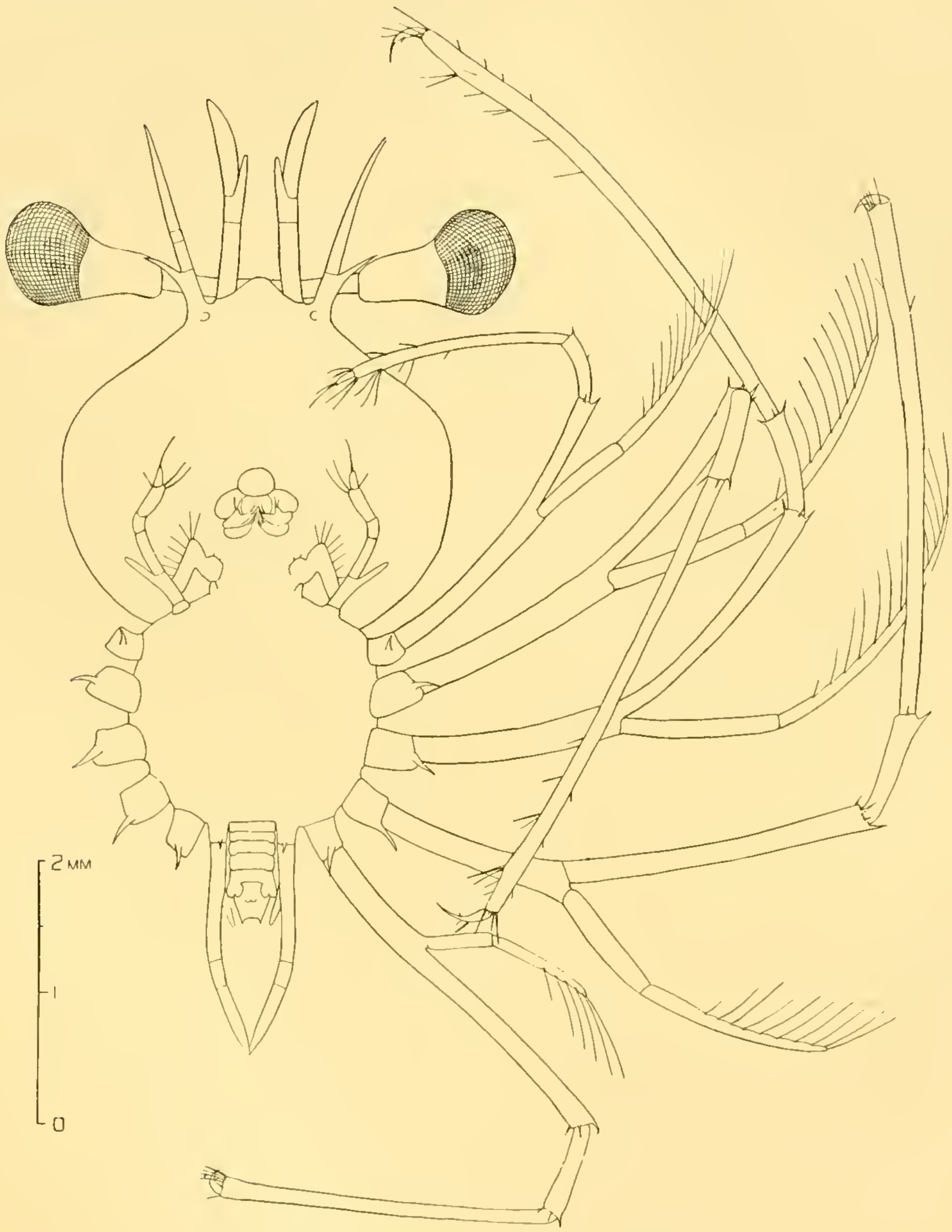


Fig. 30. *Palinurellus*?, 4·7 mm. St. 1580.

Genus Palinurellus, Von Martens? (Figs. 30, 31)

St. 1580. 8° 44′ S, 41° 50′ E. 450–0 m. One specimen.

Length 4·7 mm. Greatest width 3·3 mm. Eye 1·3 mm.; eye-stalk 0·75 mm.

Fore-body about as wide as long, with a small but perfectly distinct sharp-pointed rostrum (Fig. 31). Hind-body much narrower than fore-body, not hollowed behind. Abdomen small, distinctly segmented, with bilobed uropods but no pleopods.

Antennules with peduncle of two segments, endopod distinct. Antennae with basal part distinct from flagellum and produced outwards into a strong spine. Flagellum nearly reaching end of antennule.

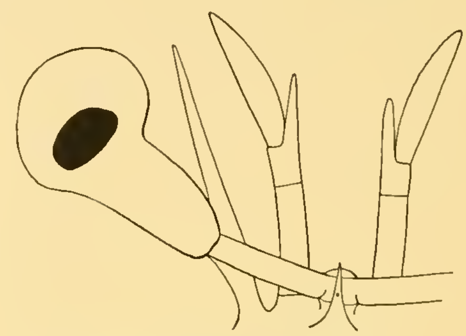


Fig. 31. *Palinurellus*?, 4·7 mm. Dorsal view of head region.

Maxillule with small papilliform palp. Maxilla with exopod large, extending behind maxillipede 2, and fringed with setae. Maxillipede 1 a small papilla. Maxillipede 2 with exopod of fair size but without setae. Maxillipede 3 having large setose exopod.

Dactyli of legs short and curved; each leg with coxal spine and a group of spines at end of merus. Leg 5 about twice as long as abdomen, segmented, with large rudiment of exopod.

It is unfortunate that only one specimen, and that a young one, of this Phyllosoma is available, since it is a very remarkable form and the last stage might give some clue to its identity. It is unique in having a well-marked rostrum, and the presence of an exopod on leg 5 is another character which is unusual, and perhaps primitive.

The form of the maxillae, presence of exopods on maxillipedes 2 and 3, and presence of a palp on the maxillule, point with certainty to the Palinuridae, and probably to near relationship to *Palinurus*; but it obviously does not belong to *Palinurus* nor *Panulirus*. There is a general resemblance to a Phyllosoma described by Santucci (1929) from the Red Sea, and regarded by him as probably belonging to *Scyllarides latus*, but Santucci does not show a palp on the maxillule and does not mention a rostrum. It is fair to assume that the adult must be a genus possessing a rostrum,[1] which excludes *Linuparus* and, perhaps, *Palinustus*. There remain only *Palinurellus* and *Puerulus*. There is no means whatever for deciding between these two genera, but *Palinurellus*, with its relatively large rostrum and pleopod on somite 1, seems to be a primitive genus, and the species *P. gundlachi* is recorded from Mauritius and may well occur farther west. I regard it, therefore, as a justifiable speculation to attach this generic name to this Phyllosoma.

Genus Scyllarus, Fabricius (Figs. 32–34)

For the genus *Scyllarus* the general characters of the Phyllosoma were established by Dohrn, who described in 1870 the first stage of *S. arctus* hatched from the egg, and by Hornell (1894), while the complete series of nine stages has been worked out by Stephensen (1923). Stephensen's account is very much more precise and convincing than that of Bouvier or Santucci for *Palinurus*. The general characters of the genus, as founded on the description of *Scyllarus arctus*, are as follows:

[1] Gilchrist (1916, p. 112) describes a rostrum in the Phyllosoma of *Jasus*, but it is very doubtful if the structure described can be so interpreted (see above, p. 422).

Fore-body much wider than long, and much wider than hind-body. Hind-body not concave behind. Abdomen, in later stages, very broad at base, and forming a direct continuation of the hind-body.

Antenna at first very much shorter than antennule, later becoming broad at base, and with large outer pointed process; flagellum short and broad.

Maxillule without palp. Exopod of maxilla with setae in stage 1, but without setae in late stages. Maxillipede 2 without exopod, or with exopod rudimentary. Maxillipede 3 without exopod. Leg 2 dactylus not greatly elongated. Leg 5 without exopod. Legs with coxal spines.

Pleopods in last stage very narrow, without appendix interna. Telson with large spine on either side.

I have not found it possible to make any specific distinctions in the small material available, though in some cases the size of corresponding stages is so different that more than one species is certainly present. Specimens from the eastern Atlantic agree in all respects with Stephensen's description of *S. arctus*, and may well belong to that species, though, so far as I know, the adult has not been recorded farther south than Senegal.

The only point of interest that arises from this material is the strong evidence that, within the genus *Scyllarus*, specific differences in the larvae are very small or non-existent.

The accompanying figures will show the close agreement between East African species of very small form (Fig. 33) and *S. arctus* as figured by Stephensen. Fig. 32 shows what is probably *S. arctus* in stage VII.

Table X. *List of stations at which Phyllosomas of* Scyllarus *were taken*

Station	Position	Depth metres	Number of specimens	Size mm.
—	29° 27′ N, 15° 7′ W	900–0	3	12–16
—	13° 25′ N, 18° 22′ W	900–0	2	12, 15
281	0° 46′ S, 5° 49′ E	850–950(–0)	1	12
277	1° 44′ S, 8° 38′ E	63–0	1	11
276	5° 54′ S, 11° 19′ E	150–0	1	10
270	13° 58′ S, 11° 43′ E	200–0	2	21, 27
269	15° 55′ S, 10° 35′ E	600–700(–0)	1	28
711	24° 41′ S, 41° 31′ W	290–0	2	13, 18
712	28° 02′ S, 43° 09′ W	224–0	1	5·5
407	35° 05′ S, 17° 49′ E	150–0	1	18
1568	34° 48′ S, 34° 28′ E	1400–0	1	17·8
1571	27° 24′ S, 39° 21′ E	500–0	1	17
1580	8° 45′ S, 41° 50′ E	450–0	1	5
1581	7° 42′ S, 44° 14′ E	600–0	1	29
1582	5° 39′ S, 46° 22′ E	1900–1850(–0)	1	18·5
1585	0° 06′ S, 49° 45′ E	500–0	2	6, 22·5

Genus Scyllarides, Gill (Figs. 35–37)

The first Phyllosoma of *Scyllarides latus*, taken from among the pleopods of the parent, has been described by Santucci (1928). Later larvae have been referred to the genus by

Stephensen (1923), Santucci (1925 *b*, 1929) and Von Bonde (1932). One of the larvae described by Santucci (1927) as probably belonging to *Thenus* (pl. iii, fig. 1) is actually,

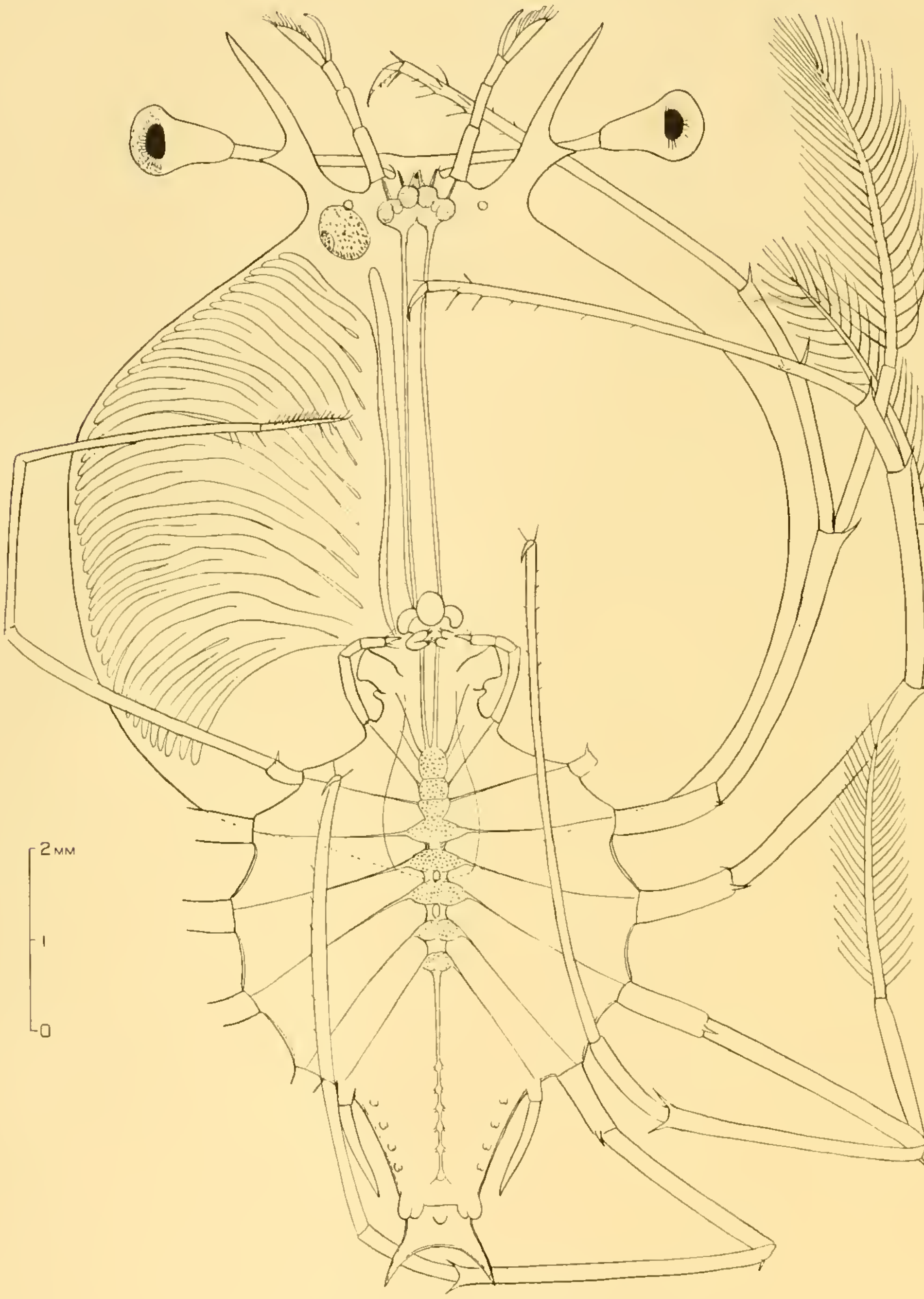


Fig. 32. *Scyllarus arctus*?, Stage VII. St. 281.

as I believe, *Scyllarides*, while the later stage figured (pl. iii, figs. 2–4) represents another genus, possibly *Thenus*. Santucci (1929) ascribed a Phyllosoma in stage III from the Red Sea to his *Thenus* series, and identified it as the larva of *Scyllarides latus*. While his *Thenus* was probably, in part, *Scyllarides*, it is not possible to accept the Red Sea

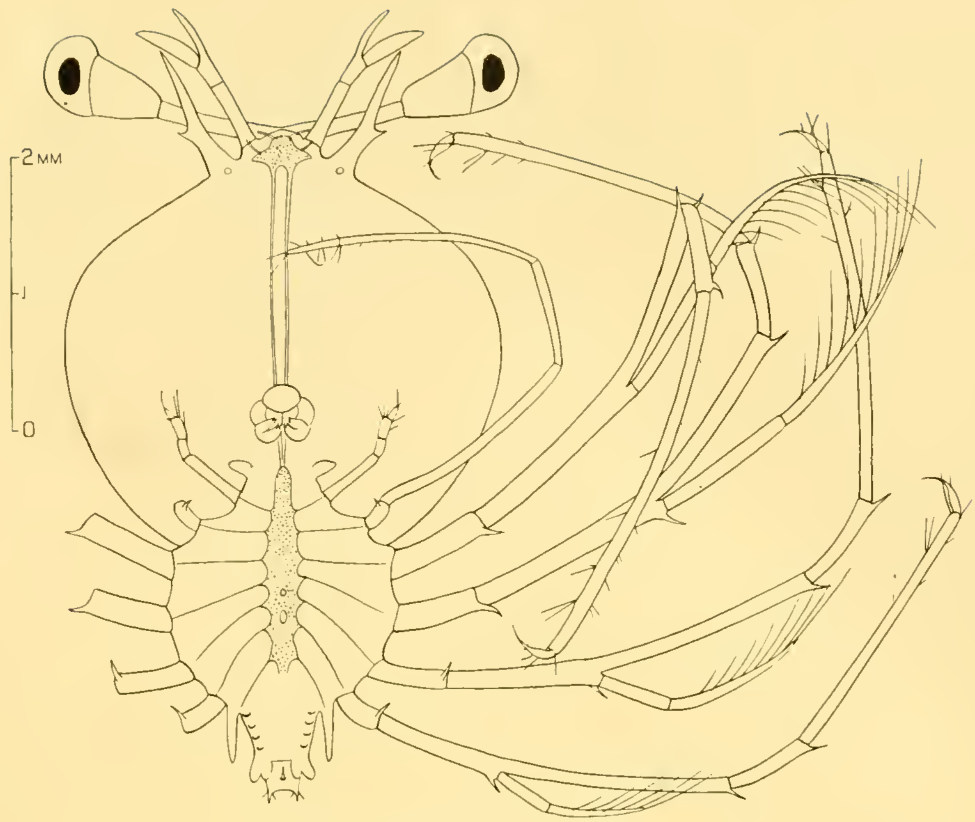


Fig. 33. *Scyllarus* sp., 5 mm. St. 1580.

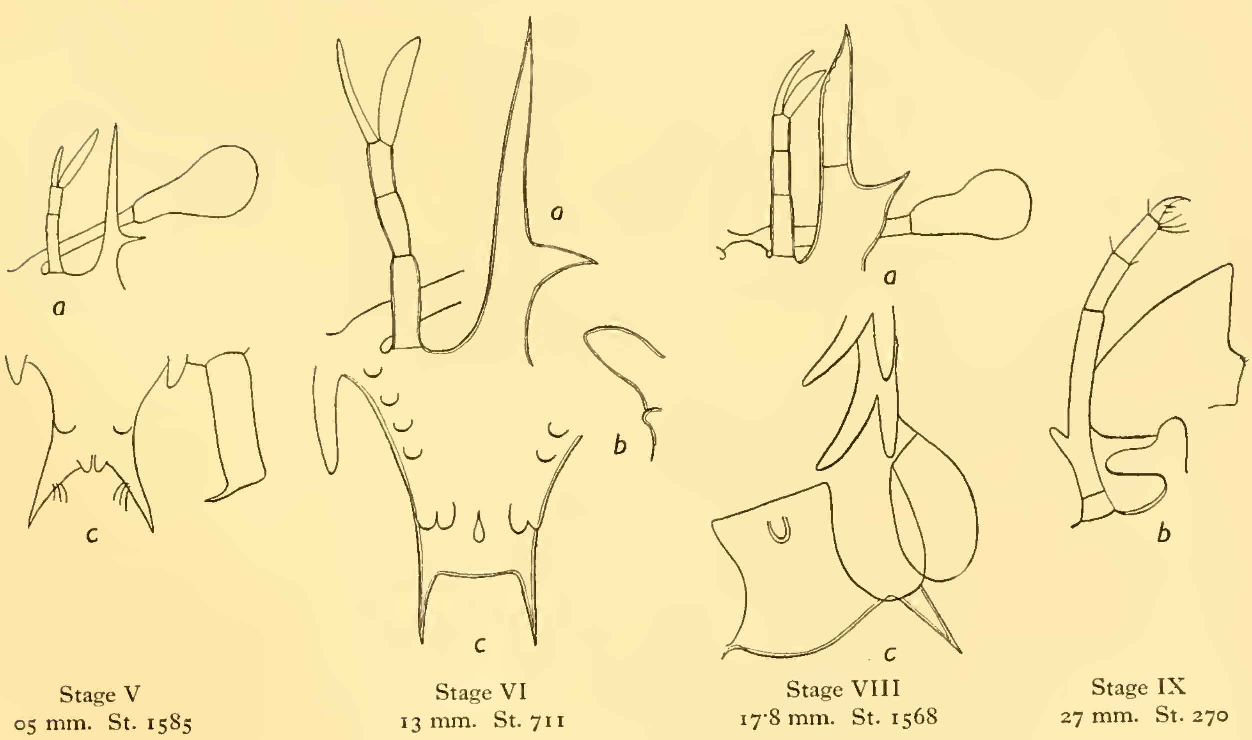


Fig. 34. *Scyllarus*, Stages V, VI, VIII, IX.

a. Antennae. *b*. Maxilla, etc. *c*. Abdomen.

larva as belonging to the same series, or even as a Scyllarid at all. One character alone completely excludes it, namely the possession at this early stage of exopods on maxillipedes 2 and 3, for in *Scyllarus* and *Scyllarides* the exopod is absent throughout development from maxillipede 3, and it is absent in the larva of *Thenus* figured by Santucci. Von Bonde (1932) has attributed to *Scyllarides elizabethae* a series of larvae taken on the south and east coasts of South Africa, mainly on the ground that this is the only common species in those waters. He distinguishes a series of eleven stages, but the differences in size and structure between some of them is very small indeed. The specimen of 11 mm. (his stage VIII) appears to be the last stage, having the gills developed, and very characteristic pointed uropods, and it is very unlikely that there should be three more stages during which the uropods change their shape to the rounded form shown in other figures. It seems much more probable that his material included larvae of more than one species, and that one of them (with rounded uropods, pl. vii) belonged to *Scyllarus*. It is to be noted also that the telson spines of his younger larvae are relatively short, as in *Scyllarus*.

Stage I of *S. latus* is characterized by having the antenna about as long as the antennule, and the great length of leg 3, but it is doubtful if these characters are sufficient to distinguish the genus from *Scyllarus*. A Phyllosoma in stage I from Bermuda (Fig. 35) probably belongs to *Scyllarides* since that genus alone is known from Bermuda, but its antennae are even shorter than those of *Scyllarus arctus*, and leg 3 is not strikingly longer than leg 2. Stephensen's larva, which is probably rightly referred to *S. latus*, is distinguished by the great length of the spines on the telson, and this may be a good character for the genus. If that is so *Phyllosoma furcicaudatum*, Bate (1888, pl. xii, D), from St Vincent, no doubt belongs to this genus.

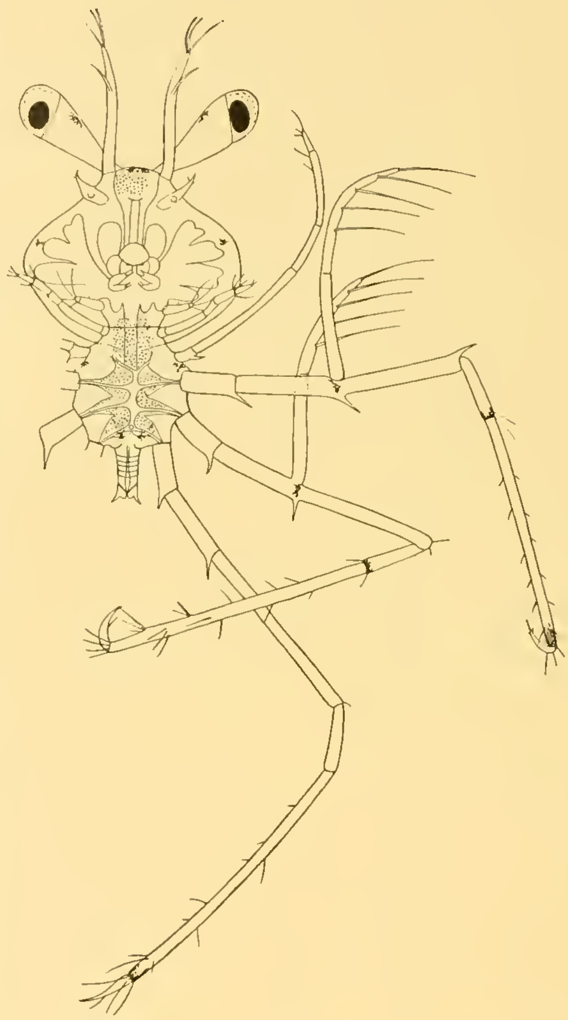


Fig. 35. *Scyllarides* sp., Stage I. Bermuda.

It is probably safe to accept long telson spines in early stages, and pointed uropods in later ones, as distinctive for the genus; but the length of the antenna does not seem to be a reliable character, and in intermediate stages, when the rudimentary uropods are rounded, the two genera may be indistinguishable.

Table XI. *List of stations at which Phyllosomas of* Scyllarides *were taken*

Station	Position	Depth metres	Number of specimens	Size mm.
701	14° 39′ N, 25° 51′ W	242–0	5	6–15
276	5° 54′ S, 11° 19′ E	150–0	1	4
407	35° 05′ S, 17° 49′ E	150–0	3	7–14
1555	39° 52′ S, 18° 42′ E	1000–0	1	14
1574	21° 45′ S, 40° 34′ E	600–0	1	13·8
1373	31° 13′ S, 31° 49′ E	135–0	1	13·5
1576	14° 42′ S, 42° 22′ E	400–0	1	13

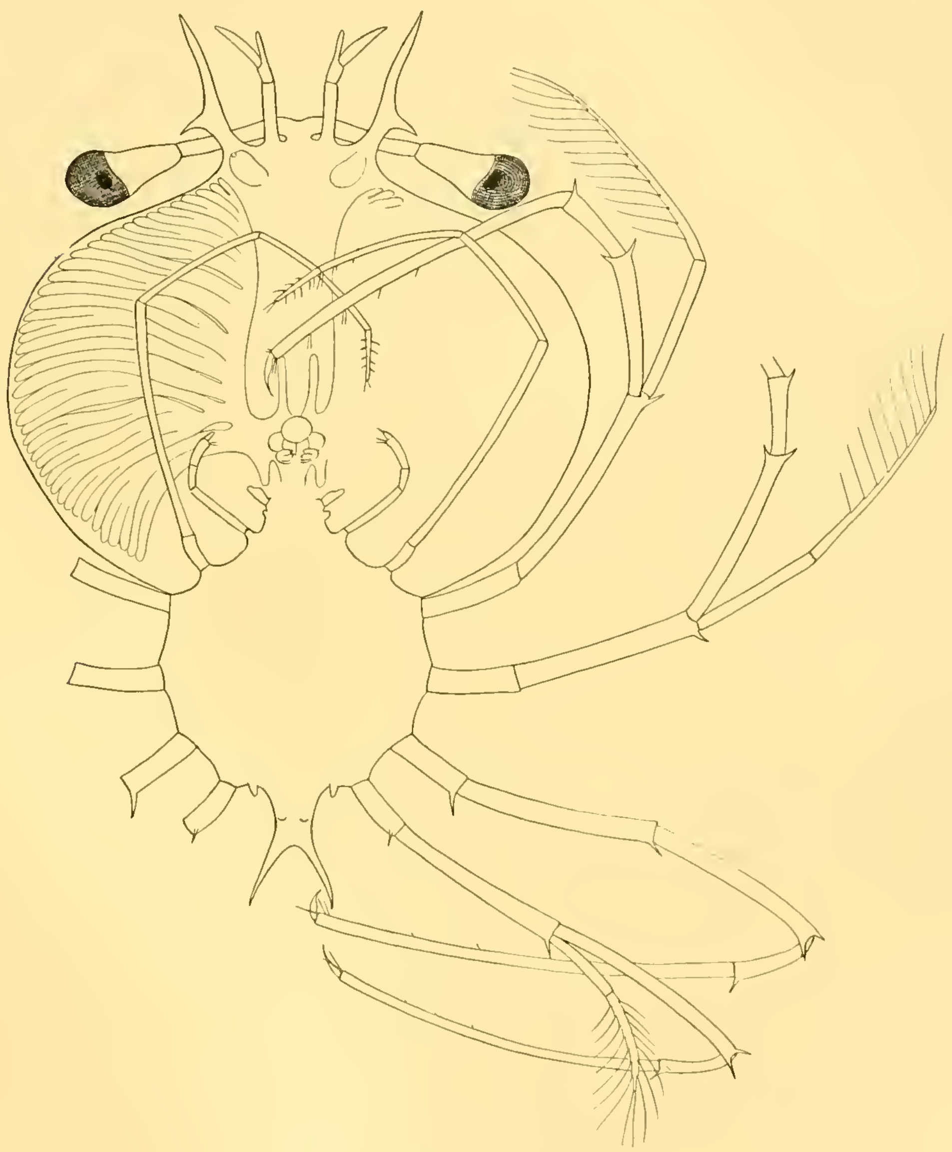


Fig. 36. *Scyllarides* sp., 6 mm. St. 701.

I refer to *Scyllarides* nine specimens from the Atlantic, as shown in Table XI, taken at three stations in the region of Cape Verde Islands, off the west African coast, and near the Cape. The specimens from St. 407 agree so closely with Von Bonde's description that I have little doubt that they belong to *S. elizabethae*, but those from Sts. 276 and 701 are larger, and may perhaps belong to *S. latus*. Four specimens taken on the east African coast may also be larvae of *S. elizabethae*.

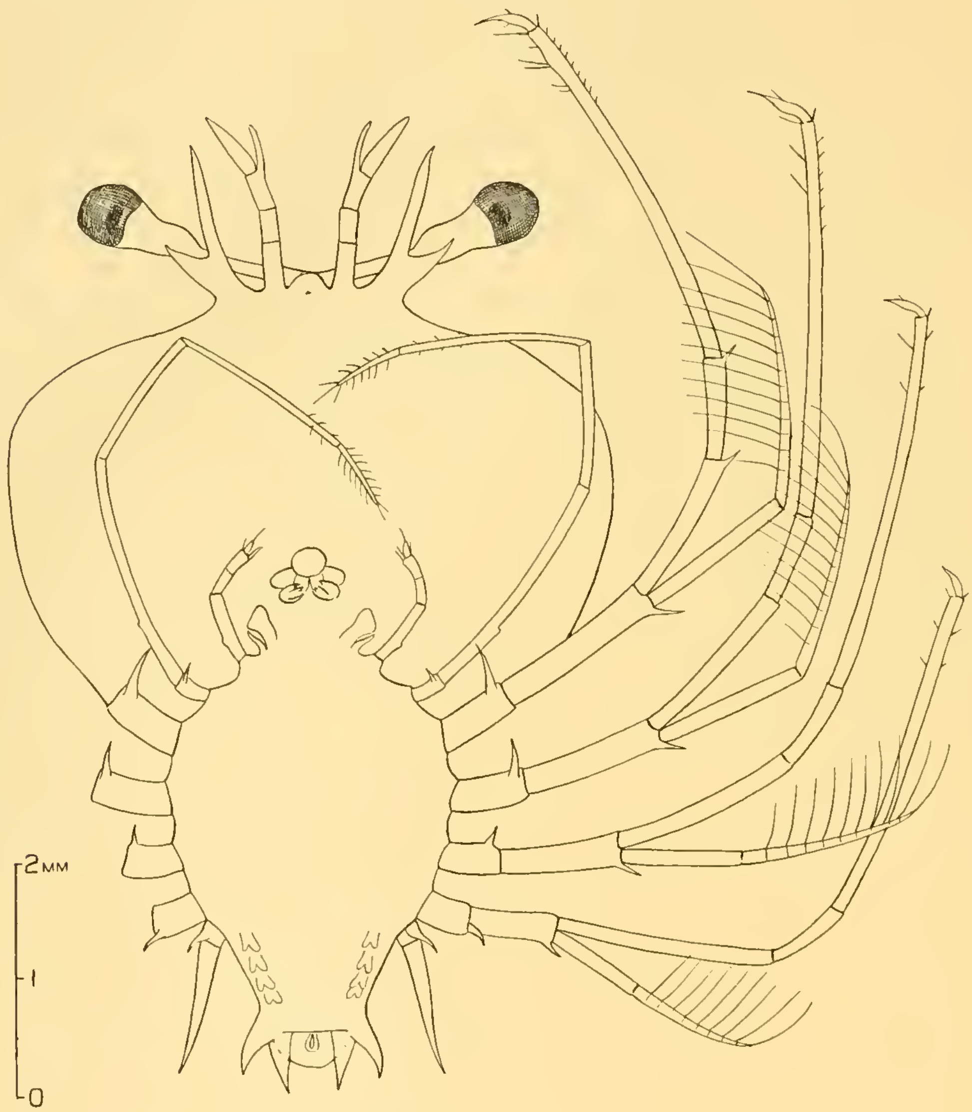


Fig. 37. *Scyllarides* sp., 7 mm. St. 407.

Genus Thenus, Leach? (Figs. 38–41)

General characters of the Phyllosoma.

Fore-body pear-shaped, narrow in front in early stages, about $1\frac{1}{2}$ times as wide as long; wider than hind-body. Hind-body deeply concave behind. Abdomen small and narrow.

Antennule with segments 2 and 3 equal, not much shorter than segment 1. Antenna short and stout, with strong pointed process on outer side of segment 2 of peduncle, segment 3 very much narrower than segment 2 in late stages.

Maxillule without palp. Maxilla without setae on exopod. Maxillipedes 2 and 3 without functional exopods. Legs without coxal spines. Leg 3 with propodus dilated at end. Leg 5 without exopod, but with small rudiment of it in late stages.

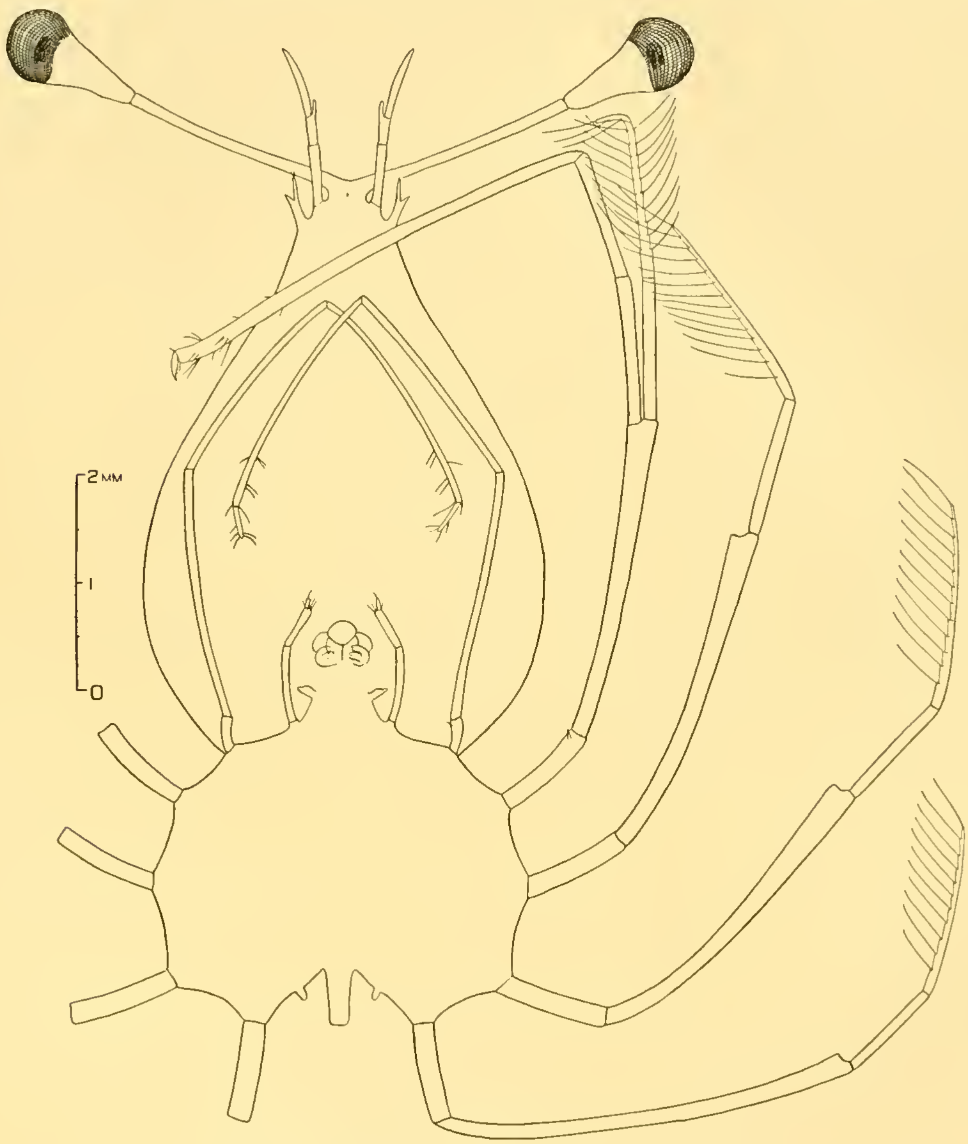


Fig. 38. *Thenus* sp.?, Stage IV?, 8 mm. St. 691.

The fifteen specimens of this form are divisible into five stages, the oldest of which is in the last stage but one. The growth factor for these stages is about 1·26 for the oldest, and increases to about 1·5 for the youngest. If this rate of growth is assumed for the unknown younger stages, and if it is assumed that the first larva is about 2·5 mm. long, there will then be three unknown stages, and the youngest of the Discovery specimens will be in stage IV. The stages may be defined as follows:

Stage IV? (Fig. 38). Length 8 mm. (pre-labral 4·4 mm.; post-labral 3·6 mm.): eye and eye-stalk 3·5 mm.

Antennule with peduncle of two segments. Antenna very short, bifurcate at end.

Maxilla with minute, narrow, apical segment, with or without setae. Of three apparently identical specimens two were without setae and one with four setae. Maxillipede 1 absent. Maxillipedes 2 and 3 without exopod. Legs without coxal spines. Leg 5 a small bud.

Abdomen small, narrow, unsegmented, without pleopods or uropods.

Stage V?. Length 12–14 mm.

Antennule with peduncle of three segments. Antenna a little longer than segment 1 of antennule, unsegmented or with basal segment marked off; with outer pointed process at end of this basal segment.

Maxilla with apical part not expanded, without setae. Leg 5 and abdomen as in stage VI, but uropods indicated by a pair of small folds.

Stage VI?. Length 20 mm.

Antenna reaching to segment 2 of peduncle of antennule, its peduncle shorter than the flagellum.

Maxilla not expanded.

Abdomen still small unsegmented. Pleopods represented by small folds; uropods bilobed rudiments.

Stage VII? (Fig. 39). Length 27–28 mm.

Ratio of length to width of fore-body 1 : 1·69; of eye to total length 1 : 3·4.

Lengths of segments of antennular peduncle as 26 : 23 : 23. Antenna with peduncle of three distinct segments, the outer pointed process being on segment 2. Segment 3 narrow and appearing to form part of the flagellum which reaches beyond the peduncle of the antennule.

Maxilla without setae, but with apical part widening. Leg 5 with basal segment distinct.

Abdomen showing segmentation dorsally. Pleopods small, not bilobed; uropods shorter than telson, the endopod not jointed to stem.

Stage VIII? (Figs. 40, 41). Length 33–36 mm.

Ratio of eye to body length 1 : 3·15.

Segment 2 of antenna very much wider than segment 3.

Maxilla without setae, widening at end. Maxillipede 1 a finger-like process, shorter than maxilla. Maxillipedes 2 and 3 with small papillae representing exopod. Leg 5 as long as abdomen, of four segments; segment 2 with a small bud, perhaps representing exopod.

Pleopods bilobed; uropods longer than telson, the branches jointed to basis. Gills absent.

Stage IX? (Fig. 41). Length 41 mm. (British Museum specimen from Congo Expedition).

Ratio of eye to body length 1 : 3·4.

Antenna with segment 2 greatly expanded, flagellum extending beyond antennule.

Maxilla with exopod expanded and reaching behind maxillipede 1, but without setae. Maxillipede 1 with epipod. Maxillipedes 2 and 3 with rudimentary exopods, without setae. Legs without coxal spines. Leg 5 with small bud representing exopod. Gills present.

Pleopods and uropods large; no spines dorsally on abdominal somite 6.

It is naturally impossible to identify this Phyllosoma; but it is evidently closely related to a form described by Stephensen (1923, p. 77) and referred by him to *Thenus orientalis*. The Discovery specimens do not seem to belong to the same species, as Stephensen's figures show strong coxal spines on legs 1–3. Santucci (1926) has described a larva of 30 mm., also from the Mediterranean, which appears to belong to the same species as my specimens, and this larva he supposes also to belong to *Thenus orientalis*.

There are great difficulties in accepting such an identification. In the first place *T. orientalis* is the only species of the genus known, and it is confined to the Indo-Pacific region, with the exception of a doubtful record from the Adriatic, and one from Natal (Von Bonde). It seems unlikely that it would have been overlooked in the Atlantic if it is as common as these larvae would show it to be. It is also evident that there must be two distinct species in the Mediterranean of the genus to which these larvae belong.

At the same time, our knowledge of the distribution of adult Decapoda is not so exhaustive that such an argument can have much weight.

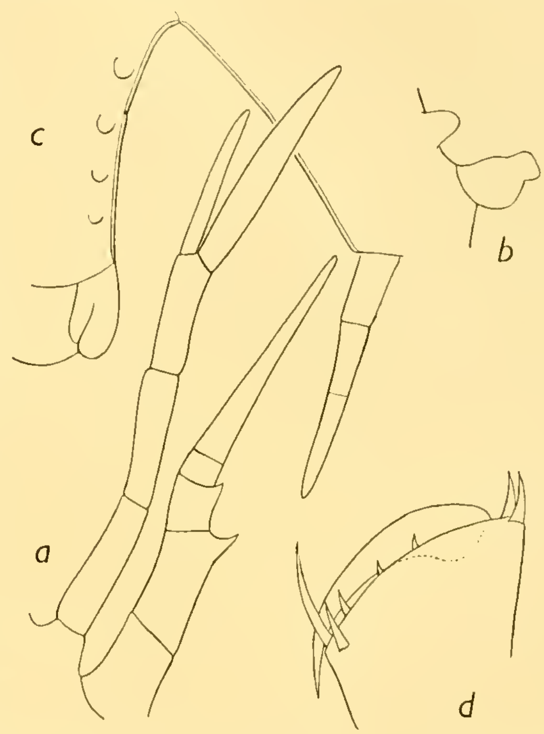


Fig. 39. *Thenus* sp.?, Stage VII?. St. 704.
a. Antennae. *b*. Maxilla, etc.
c. Abdomen. *d*. End of leg 4.

If we knew only the Phyllosomas of *Palinurus* and *Scyllarus* this Phyllosoma would certainly be regarded as a Palinurid; but it appears that the differences between these two genera cannot be taken as valid for their families. We have already seen that the absence of an exopod from the maxillipedes is not confined to the Scyllaridae, and, if the Phyllosoma described below as *Parribacus*? is in fact a Scyllarid, then a "Panulirid" form of body may also be found in the Scyllaridae. The only character which seems to hold good for separation of the families is the form of the antenna in the last stages, and in the Phyllosoma in question there is a tendency to broadening of the base which indicates a possible relation to the Scyllaridae.

For these reasons I accept provisionally the reference of this form to *Thenus* by Stephensen and Santucci, but without conviction of its soundness.

Table XII. *List of stations at which Phyllosomas of* Thenus? *were taken*

Station	Position	Depth metres	Number of specimens	Size mm.
Discovery collection				
293	4° 18′ N, 16° 51′ W	100–120(–0)	1	27
704	3° 38′ N, 29° 14′ W	231–0	1	28
692	2° 02′ N, 30° 08′ W	350–0	2	13, 14
691	0° 25′ S, 29° 56′ W	400–0	9	8–33
690	3° 18′ S, 30° 00′ W	460–0	2	10, 33
British Museum collection				
—	36° S, 9° E	—	1	32
—	13° S, 25° W	—	1	36
—	Atlantic	—	2	38, 43
—	Africa: Congo Exped.	—	1	41

Other localities: Mediterranean (Stephensen, Santucci).

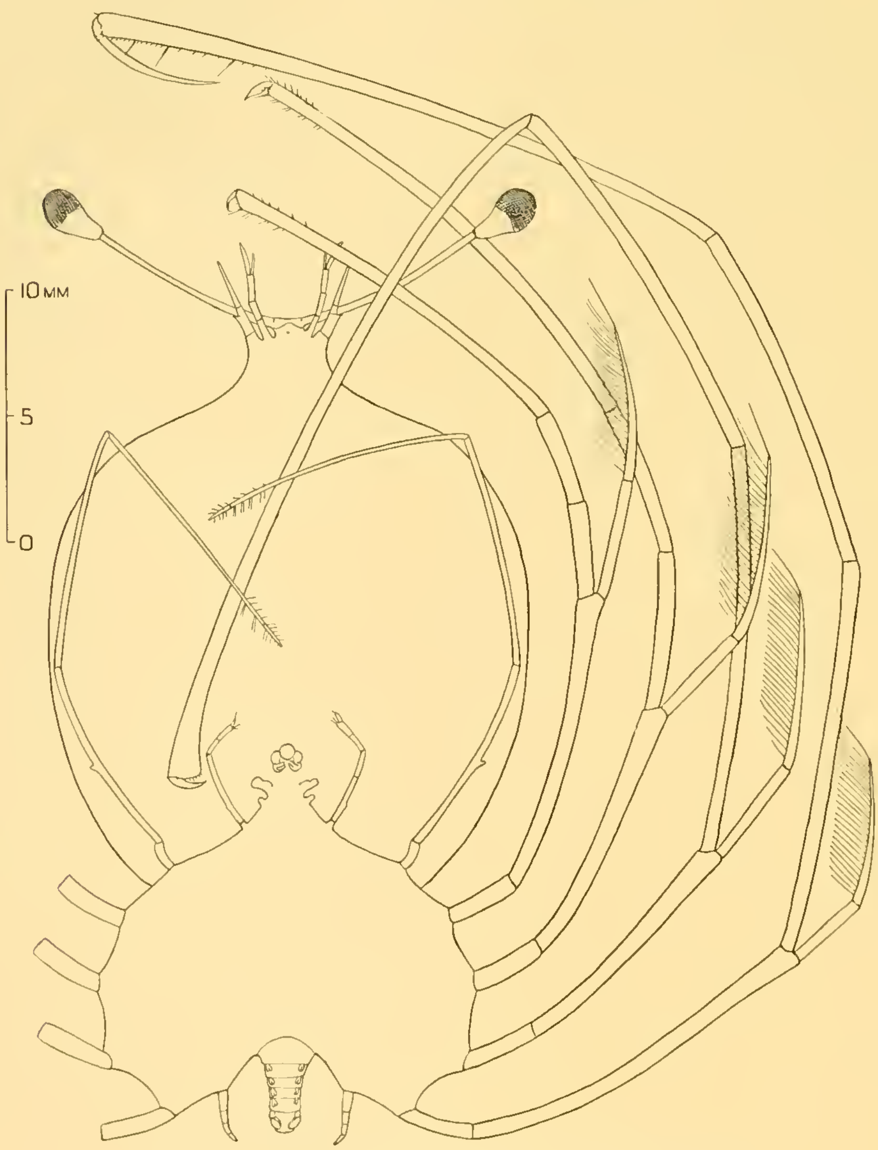


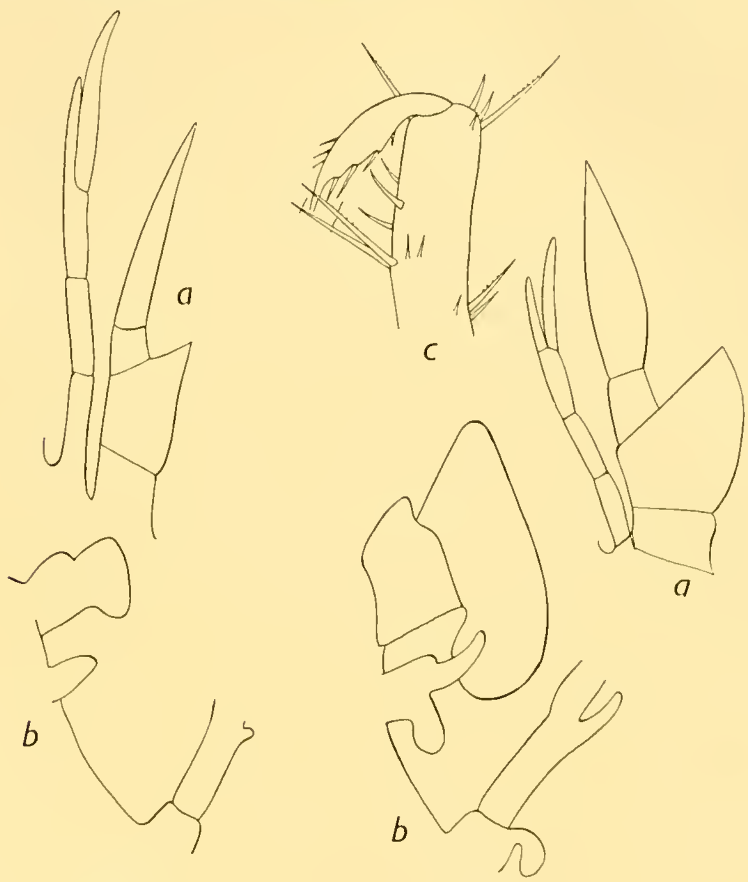
Fig. 40. *Thenus* sp.?, Stage VIII? 33 mm. St. 691.

Genus **Parribacus** Dana? (Fig. 42)

General characters of the Phyllosoma.

Fore-body pear-shaped, narrow in front, narrower than hind-body. Hind-body very deeply hollowed behind. Abdomen small and narrow, completely sunk in hollow of hind-body.

Segment 2 of antennular peduncle slightly longer than segment 3. Antenna small, basal part widened in late stages.



Stage VIII ? Stage IX ?

Fig. 41. *Thenus* sp.?, Stages VIII–IX?.
a. Antennae. *b.* Maxilla, etc. *c.* End of leg 1, Stage IV?.

Maxillule without palp. Maxilla without setae, not widened in any known specimens. Maxillipedes 2 and 3 without exopod. Leg 5 fully developed, with setose exopod (in all known specimens), and seated at a distance from abdomen. Pleopods and uropods greatly delayed in appearance.

Only three specimens of this Phyllosoma were taken by the 'Discovery II', at the following stations:

St. 691. 0° 25′ S, 29° 56′ W. One, 15 mm.
St. 1576. 14° 42′ S, 42° 22′ E. One, 20 mm.
St. 1582. 5° 39′ S, 46° 22′ E. One, 37 mm.

The specimens from the east coast of Africa are not distinguishable from the Atlantic specimen.

Although the oldest of these three specimens is more than twice the size of the smallest one, it differs very little in degree of development. The antenna shows a division into flagellum and peduncle, and the latter is rather stout, with a small outer projection (Fig. 42 *b*). The maxilla is not expanded, and without setae, and maxillipede 1 is a small papilla. In the specimen of 20 mm. this appendage is not traceable at all. The abdomen in the two smaller specimens is unsegmented, without trace of pleopods, and the uropods are represented in the larger specimen by small folds. In the specimen of 37 mm. the abdomen is still not much more developed, but the pleopods are represented by small simple lobes and the uropods are small and bilobed.

This form of Phyllosoma is very remarkable by reason of the large size reached without much progress in development of antennae, mouth parts and abdomen, while leg 5, which is usually late in developing, is fully formed and provided with an exopod in the smallest specimens known.

Phyllosomas of precisely similar form have been described by Guérin, Richters and Spence Bate. Spence Bate's specimen, of 30 mm., was taken in the West Indies and may well belong to the same species as the one from St. 691. *Phyllosoma guerini*, de Haan, also has an exopod on leg 5, but is otherwise very different. A Phyllosoma from China described by Richters (1873, pl. 34, fig. 1) seems to belong to the same genus as *P. guerini*, and there is reason to believe that this genus may be *Ibacus* (Balss, 1914, p. 81).

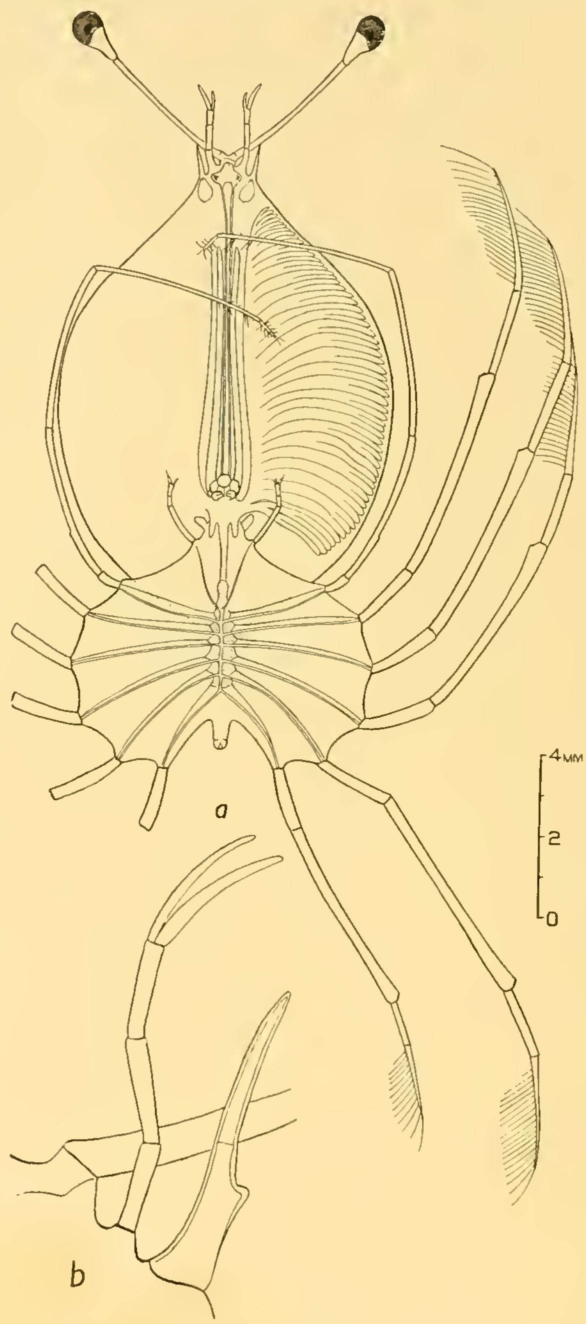


Fig. 42. *Parribacus* sp.?
a. Specimen of 15 mm. St. 691.
b. Antennae of specimen of 37 mm. St. 1582.

Richters included the type under discussion in the "Phyllosomes brevicaudes" of Milne-Edwards, and refers them to the Scyllaridae. The general form of the body is so

strikingly similar to that of *Panulirus* that it is difficult to believe that this identification can be correct. The Phyllosomas referred to this group are mainly Indo-Pacific and attain to such extraordinary sizes as 75 mm. (Richters). Having regard to the degree of development of antennae and mouth-parts in larvae of nearly 40 mm. it is probable that there is a long series of later stages during which much change of shape of body and of appendages may take place, and the widening of the antenna seen in the specimen of 37 mm. might lead to a Scyllarid form. Richters figures (pl. xxxiv, figs. 5, 6) two larvae of 61 and 75 mm. which combine the Scyllarid form of antenna with the deeply excavated hind-body of *Panulirus*, so that it is clear that the latter character is not confined to the Palinuridae and it seems necessary to accept Richters' reference of this group of Phyllosomas to the Scyllaridae.

So far as concerns the genus to which the Discovery specimens belong only speculation is possible, but it must be one with a representative in the western Atlantic. The genus *Thenus* must be excluded if its Phyllosoma is as described above, and of the other genera of Scyllaridae only two species are known from the Atlantic: *Ibacus verdi*, Bate, and *Parribacus ursus* (Herbst). The genus *Pseudibacus*, Guérin, is supposed by Bouvier to be the natant stage of *Scyllarus*. As *Parribacus ursus* is known to occur in the Caribbean Sea and also throughout the Indo-Pacific region (De Man) it is a reasonable guess that this may be the parent of the Phyllosoma in question.

KEY TO THE FORMS OF PHYLLOSOMA HERE DESCRIBED

a. Maxillipede 3 with setose exopod.
- *b*. A small rostrum present ... ... *Palinurellus*?, p. 425.
- *bb*. Rostrum absent.
  - *c*. Hind-body not wider than fore-body; lengths of segments of antennular peduncle about as 3 : 1 : 2 ... ... *Palinurus*, p. 401.
  - *cc*. Hind-body wider than fore-body; antennular segments about as 2 : 1 : 1 *Panulirus*, p. 405.
    - *d*. Coxal spines absent; exopod of maxilla without setae to last stage *Panulirus B*, p. 411.
    - *dd*. Coxal spines on maxillipede 3 and leg 1; maxilla with setae *Panulirus A*, p. 407.
    - *ddd*. Coxal spines large, on all legs; maxilla with setae ... *Panulirus D*, p. 415.

aa. Maxillipede 3 without exopod, or with small rudiment only.
- *b*. Antenna slender, with long flagellum; leg 5 fully developed at early stage *Jasus*, p. 416.
- *bb*. Antenna enlarged at base, flagellum short and broad; leg 5 generally developing late
  - *c*. Leg 5 with setose exopod ... ... *Parribacus*?, p. 437.
  - *cc*. Leg 5 without setose exopod.
    - *d*. Abdomen much narrower than hind-body ... ... *Thenus*?, p. 432.
    - *dd*. Abdomen broad at base, forming continuation of hind-body.
      - *e*. Telson spines relatively short; uropods rounded throughout development *Scyllarus*, p. 426.
      - *ee*. Telson spines long in early stages; uropods pointed in late stages *Scyllarides*, p. 427.

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